5-1989

Dermatoglyphic variation among Sub-Saharan Africans: $ba multivariate analysis of population structure

David Roehm Hunt

University of Tennessee

To the Graduate Council:

I am submitting herewith a dissertation written by David Roehm Hunt entitled "Dermatoglyphic variation among Sub-Saharan Africans: $ba multivariate analysis of population structure." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Anthropology.

Richard L. Jantz, Major Professor

We have read this dissertation and recommend its acceptance:

Accepted for the Council:

Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

To the Graduate Council:

I am submitting herewith a dissertation written by David Roehm Hunt entitled "Dermatoglyphic Variation Among Sub-Saharan Africans: A Multivariate Analysis of Population Structure." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Anthropology.

Richard L. Jantz, Major Professor

We have read this dissertation
and recommend its acceptance:

Accepted for the Council:

Vice Provost
and Dean of the Graduate School

DERMATOGLYPHIC VARIATION AMONG SUB-SAHARAN AFRICANS:
A MULTIVARIATE ANALYSIS OF POPULATION STRUCTURE

A Dissertation
Presented for the
Doctor of Philosophy
Degree
The University of Tennessee, Knoxville

David Roehm Hunt

May 1989

ACKNOWLEDGMENTS

I first express my deepest gratitude to my committee chairman, Dr. Richard L. Jantz. Without his guidance in the realms of dermatoglyphic variation, anthropological thought and statistical analysis this investigation could not have been possible. His insight, patience and easy going encouragement were there when I needed them, for that I thank him. I also thank Dr. Fred Smith and Dr. William M. Bass from the Anthropology Department, and my out of department committee member, Dr. Alfred Beasley, Chairman of the School of Medicine for their willingness to serve on my dissertation committee. Their insightful comments on the design and preparation of the various drafts of this study, greatly aided in its completion.

A very special thanks is extended to Mr. Heinz Brehme of the Freiburg University, Germany. His dedication to the collection and analysis of human dermatoglyphics is phenomenal. Without his devotion to collection and adherence to systematic analysis, this study would not have been feasible. The momentous amount of dermatoglyphic data he and R.L. Jantz have accumulated thus far will be invaluable for generations of research in the future; but there are many more years of collection yet to come.

I also wish to thank Dr. H.W. Hitzeroth for his contributions to the understanding of African population relationships, especially those in South Africa. One of my inspirations for this research rose from his contributions to the study of African people. To all the investigators too numerous to name here individually, I thank you for your contributions to the field of dermatoglyphic study and for generously making your data available for analysis by Heinz Brehme.

Canonical analysis and Principal coordinate analysis were performed using the University of Tennessee Computing Center facilities.

On a personal note, I would like to acknowledge the limitless moral and financial support of my parents, Dr. James C. Hunt and Mrs. Arlys R. Hunt. Without their love and encouragement I would would be nothing. And finally to my wife, Cindy, I thank you for your help in preparing and rewriting the many forms of this manuscript, and mostly for your patience and love though these years of student life.

ABSTRACT

It has been previously observed that population structure analysis using dermatoglyphics tends to follow similar patterns formed by other biological features (serology, craniometric, anthropometrics), and reflect relevant linguistic or geographical distributions. But the level of these correlations has not been consistantly identified, causing some debate over the validity of dermatoglyphics as a form of study in human populations. A systematic analysis of a series of populations needs to be made to evaluate how well dermatoglyphic variables generate significant genetic, cultural and geographical relationships between groups, and which particular dermatoglyphic features best present these population affinities .

Using multivariate statistical methods, the five most widely employed dermatoglyphic techniques are tested for their ability to present understandable population structure. Complete 20 finger ridge-counts, 10 finger ridge-counts, palmar interdigital ridge-counts, finger pattern frequencies and palmar pattern frequencies, following standard methods, were obtained for 50 African tribal populations.

Mahalanobis D-square distance matrices were generated for each of the dermatoglyphic data sets and tested for

significance by canonical analysis. Principal coordinate plots were used to visualize patterns of geographical, biological or cultural affinity present in the distributions. D-square matrix correlations between the dermatoglyphic distance and the linguistic and geographical distance matrices were produced to quantify shared information between the dermatoglyphic data sets.

Results from this study reaffirm the multidimentiality of dermatoglyphics illustrated by the variation in ridge-count and pattern frequency distributions. Although all the tested dermatoglyphic techniques produced some level of group relationship, the use of all 20 finger ridge-counts produced the best representation of geographic and biological group associations. Distance relationships between dermatoglyphic methods and linguistic affinities were significant, supporting previous findings along these lines. Geographical distributions were marginally significant only in the finger ridge-count variables. Group relationships present in this study agree with the Bantu expansion hypotheses for Western population migrations into Southern regions late in African prehistory. The agreement with these hypotheses and other biological distributions of African populations substantiate dermatoglyphics as a viable research method for evaluating biological aspects of population structure analysis.

TABLE OF CONTENTS

SECTION PAGE

SECTION PAGE

LIST OF TABLES

TABLE PAGE

LIST OF FIGURES

FIGURE PAGE

I. INTRODUCTION

Biological observations of African populations have been made since the advent of writing. Egyptian accounts of two millennia ago identify "dwarfs" or Pygmees brought back to dance for the Pharaohs. Aristotle discussed the Pygmees in his History of Animals (Hiernaux, 1975:113), commenting on their body morphology. One of the earliest Greek oral histories, the Odyssey, describes some wholly-haired black individuals (Brues, 1977:10). Ethiopians in Greek means scorched ones, believing that Negroid black skin was a product of constant burning from the strong equatorial sun.

With the influx of European populations into Africa during the 17th Century, descriptive reports of African tribes began to be presented at scientific meetings and in journals. Many of these early accounts were quite ethnocentric in their approach and thus today are only of historical interest. This ethnocentric attitude continued and strengthened with European colonial governments which have controlled much of Africa for several centuries. As a result, Africa has been considered by many to be an evolutionary and cultural backwash in relation to European societies. Nevertheless, considerable specialization and technological evolution of African societies have taken place in response to changing environmental and cultural pressures. In fact some of the "State" cultures of Western Coastal Africa rivaled any social system during their time in World history.

Anthropological investigation in Africa has improved with an ever increasing advancement of ethnographic research techniques. More recent research follows greater objectivity to culture lifeways and a greater understanding of inter- tribal relationships. Unfortunately, earlier reports were not as concise in their observations, therefore, what remains of African cultural heritage must be gleaned from remaining oral histories or surviving cultural practices. To augment this ethnographic loss, it is through archaeology, linguistic glotto-chronology or biological population correlations that much of African population structure is now interpreted. Although these forms of analysis have been used since the turn of this century, deciphering population patterns has not been really realized until after 1950. Specialization in biological quantification and more complex statistical analysis aided by computers have contributed to great advances in the understanding of population relationships in Africa. Even with these advances, there are many aspects which are still in debate and require further study.

The Bantu Expansion Hypothesis

Many forms of the Bantu language are spoken in over half of the 12 million square miles of Sub-Saharan Africa. The widespread nature of this language is quite remarkable and not an expected pattern found in human linguistics. Because of this, linguists have been interested in learning the nature of this Bantu distribution. Studies marshaled by Murdock (1959), Gutherie (1962), Greenberg (1966), and Heine (1973) all identify a proto-Bantu genesis, believed to have arisen in West Central or Central Africa. In some manner, either through actual migration or by strong widespread trade networks, the language and associated cultures quickly spread throughout Africa during the Neolithic and Early Iron Ages (1000 BC - 500 AD). This has been called the "Bantu Expansion Hypothesis".

Western Africa contains well differentiated Bantu dialects, suggesting a relatively long evolutionary period for differentiation after initial dissemination of the Bantu populations. In South Africa, however, the dialects are rather homogeneous suggesting little time for differentiation, but the amount of diversity in the Bantu language is still not fully determined. The premise of the Bantu Expansion Theory is not yet solidified and conflicting arguments are found concerning the patterns of movement reflected in linguistic and culture history. Renewed examination of the Bantu language by Bastin, et al. (1979;1983) identifies a Western and Eastern stock of Bantu, divergent from a common ancestral stock much earlier than once thought. This differs from Greenberg's and Gutherie's classifications and therefore from migration theories based on these classifications. More research in this field is needed to contend with these inconsistencies.

The Bantu Expansion theory has also been investigated using archaeological and biological anthropological research designs. Population relationships have been studied between Bantu peoples and indigenous peoples they assimilated or displaced during the Bantu migrations through cultural artifacts, serology, anthropometrics, craniology and dermatoglyphics.

Archaeological Studies

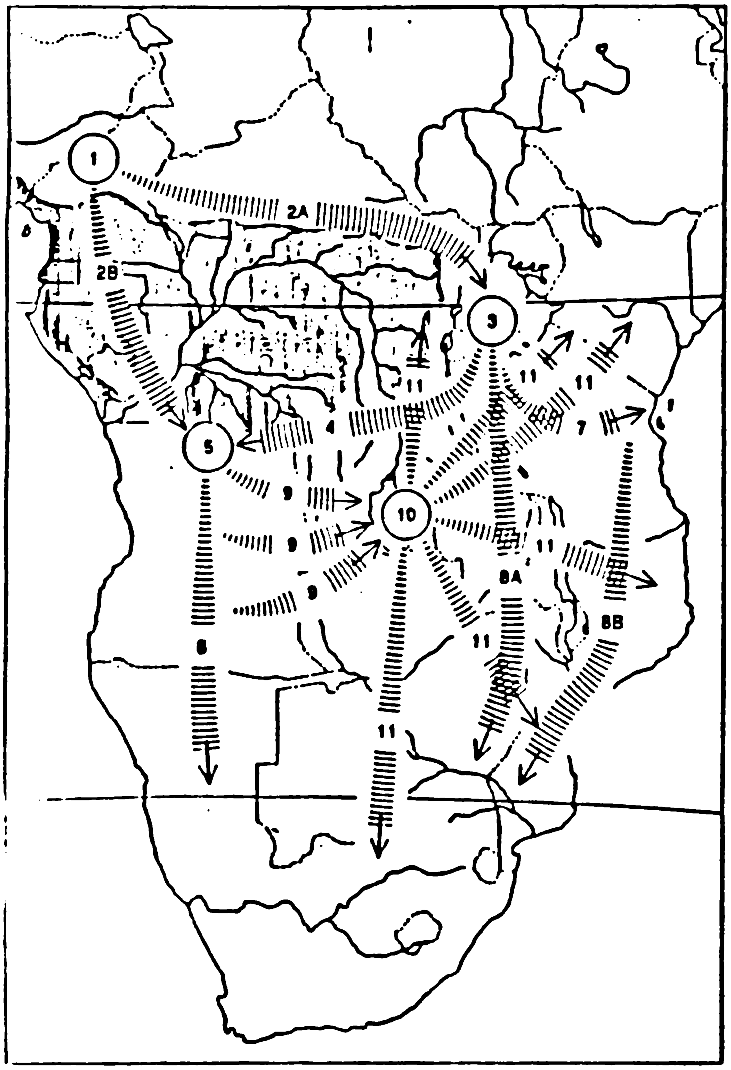
Phillipson (1977a, 1977b) and Oliver (1966) have used archaeological evidence to evaluate affinities of various cultures in Sub-Saharan Africa both on a regional and continent-wide aspect, proposing some synthesis to the overall relationships of African peoples through time.

There are several problems with archaeological studies done in Africa, however. Preservation of organic materials is especially poor because of the high acid content in about 95% of the soils throughout the continent. Therefore, preservation of skeletal material and vegital material is virtually eliminated. Besides this problem, sites are generally not well stratified, geographical restrictions can make access to the sites either impossible or very costly and political problems can often disrupt years of work.

Despite these restrictions, archaeological investigation has been quite active in the past several decades. Radio-carbon dates of Neolithic and Iron Age sites have been reviewed by Fagan (1965, 1966, 1967) and by Phillipson (1970;1975) describing over 400 well established dates throughout West and Central Africa. The Neolithic/Iron Age transition is of particular interest because the advent and integration of agricultural subsistence and the spread of iron smelting technology both occur synchronously with the 'Bantu expansion' of West African peoples into southern Africa. The relationship of the Bantu-speaker migrations and the introduction of agriculture and iron smelting into Southern Africa have been discussed in depth from various points of view (Phillipson, 1977b; Posnansky, 1961;

Oliver, 1966; Vansina, 1984). It is relatively undisputed from the various archaeological interpretations that there is a distinct relationship between population migrations from the west to the south and the dissemination of agriculture and Iron Age cultures in these areas. Phillipson (1977b) identified various waves of migration based on archaeological information in conjunction with linguistic analysis. These stages of movement are presented in Figure 1.

Phillipson believes the superior technological abilities of Iron Age cultures was the key to easy intrusion into southern Neolithic cultures. But Vansina (1984) suggested that an increased population density stemming from the higher carrying capacity of agricultural based subsistence caused population dispersion as a response to population overcrowding, before the spread of iron technology. This belief is supported by the presence of West African type dimple-based/Channeled ware at sites in South Central Africa without any indication of iron materials or smelting (Posnansky, 1968). Radiocarbon dates in this area confirm the presence of Western African cultural materials before iron technology.



HYPOTHETICAL PROGRESSION of Bantu-speakers over some 2,000 years sees the language arising among a Neolithic people before 1000 B.C. (*1*). A dual movement then seems to have brought Bantu-speakers, some using iron, beyond the forest (*3, 5*). An east-to-west movement (*4*) reinforced southward expansion of languages ancestral to the Western Group (*6*). Early in the first millennium A.D. the eastern stream expanded to the south (*7, 8*). The western stream (*9*) gave rise to a center (*10*) that sent forth languages ancestral to the Eastern Group (*11*) in the 11th century A.D.

Figure 1. Phillipson's Bantu Expansion Hypothesis. From Phillipson (1977a:109).

Linguistic Studies

Glotto-chronology has been extensively used as a means for analyzing Sub-Saharan population affinities. Using a base lexicon of 22,000 words, Gutherie (1948, 1962) identified various dialects of the Bantu language. From the distribution frequencies of his base lexicon, Gutherie identified the Proto-Bantu nucleus in the Luba region of northern Katanga (southern Zaire). In this nucleus, the frequency of shared words between the dialects was greater than 50%, suggesting a common origin to all the dialects coming from this area. From this center, four waves of Bantu migration took place in different directions (Figure 2). With each successive wave, the shared lexicon frequencies decreased due to the diffusion of the common Bantu language through time and the incorporation of other indigenous languages. It has since been shown that Gutherie's assumptions on the biological relationships of Bantu groups from his lexicon frequencies did not correctly reflect biological relationships (Vansina, 1984). Because Oliver (1966; Oliver and Fagan, 1975) relied on Gutherie's linguistic relationships for his archaeological interpretations, his studies have also become antiquated in many respects. Despite Gutherie's unrealistic timing sequences, his Bantu nucleus in Upper Zaire still correlates with

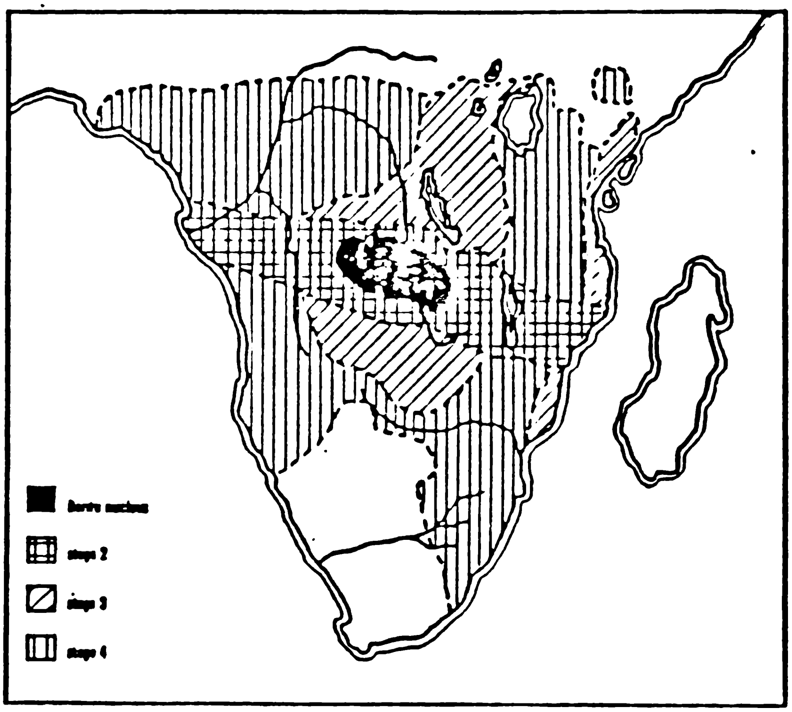


Figure 2. Gutherie's Four Stages of Bantu Expansion.
From Hiernaux (1975:176).

archaeological findings of a large Iron Age expansion disseminating from this area. Although Gutherie's interpretations fell short of the original West African Bantu dissemination, he did identify the secondary expansion of Bantu peoples from south of the Congo basin.

Linguistic studies done by Westermann (1927, 1935), were the framework for a continent-wide assessment of all African languages done by Greenberg (1966, 1972). Greenberg was interested in the linguistic relationships of all African languages, not only the varieties of Bantu. Using a base lexicon of 50 shared words, Greenberg, identified four major linguistic classifications in Africa: Congo-Kordofanian, Nilo-Saharan, Afro-asiatic, and Khoisan (see Figure 3 for distributions of these languages). By the frequencies of shared or similar phonemes, Greenberg suggested the Bantu language showed some level of intrusion into most all languages south of the Sahara. The linguistic intrusion followed in a North-western/South-eastern cline with the greatest dialectical differentiation in the Cameroon-Nigeria region of West Africa. Based on the premise that a region of linguistic origin will contain greater dialectical variation through extended linguistic evolution, this West African region was identified by Greenberg as the origin of Bantu language.

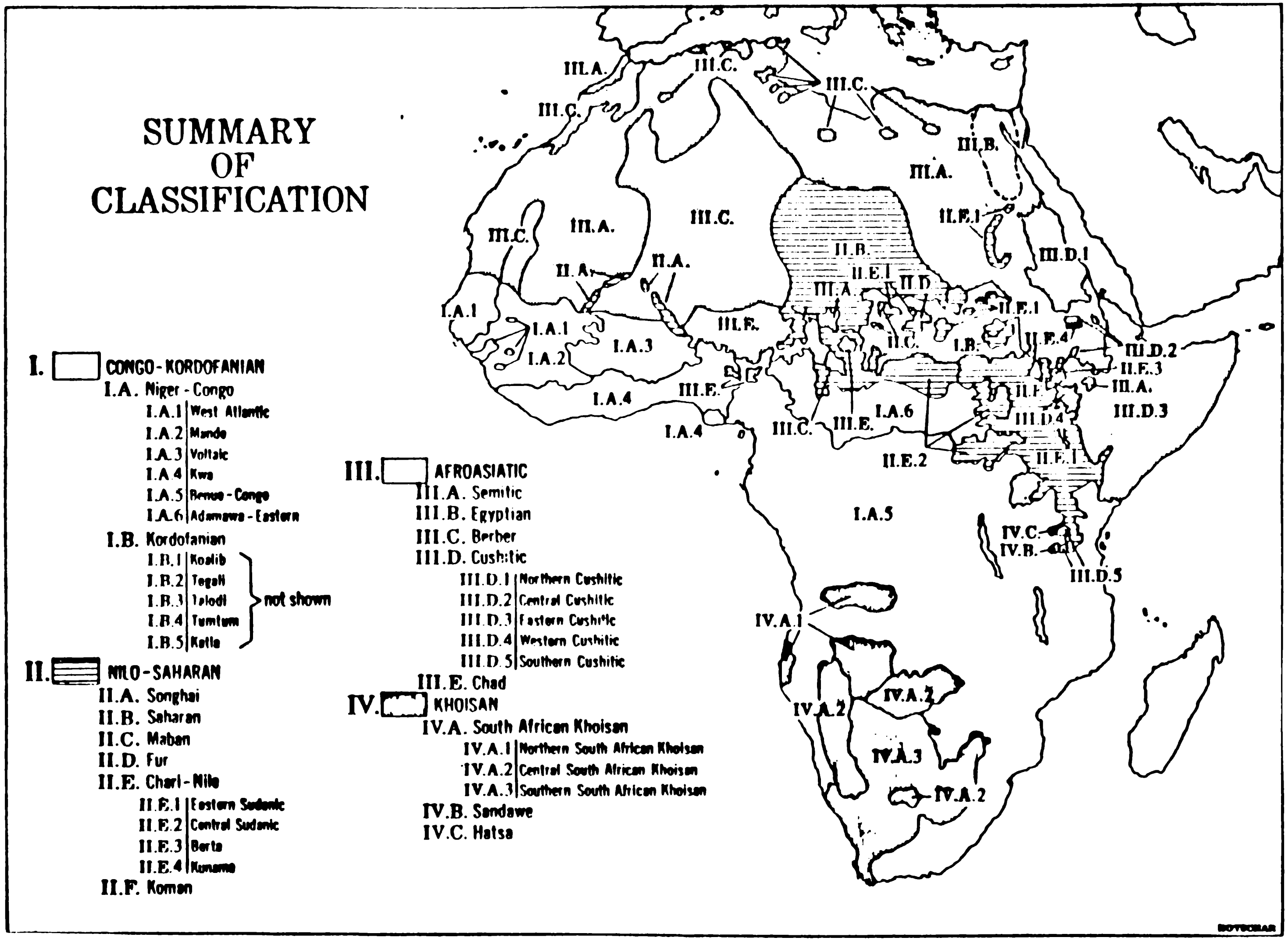


Figure 3. Language Groups and Geographical Distribution of Greenberg's Linguistic Classification System. From Greenberg (1966).

Although Greenberg's and Gutherie's Bantu centers are not in the same area, their interpretations of the Bantu migrations are not necessarily inconsistent. When including the archaeological evidence of the Late Stone Age and Early Iron Age transition, both linguistic analyses identify a primary radiation of technology from the Nigeria-Cameroon area, coalescing south of the Congo Basin region (Gutherie's nucleus). From this region, expansions south, east and west later occurred. The pattern of archaeological evidence for technological change coincides with both linguistic theories without much trouble. Phillipson (1977a), however, believes Greenberg's theory agrees more readily with the archaeological record, and subsequent studies of African populations have generally used Greenberg as a basis for linguistic identification and affinity.

Vansina (1984) refers to a recently published study of Bantu languages done by Bastin, et al. (1983). This project has categorized 250 of the approximately 450 Bantu languages in Africa. They believe the Bantu language is no longer a clear linguistic category, but should be subdivided into East and West components containing several distinct dialects (Vansina, 1984:131). Bastin, et al. (1983) contend the proto-vocabulary is much older than previously thought, with clear distinctions between earlier Western and later Eastern Bantu dialects. In contrast, Greenberg believed there were not enough lexicon differences to separate the various Bantu dialects into separate categories.

Biological Studies

Blood polymorphisms have long been used as means for population structure analysis, primarily because of their selectively neutral properties. The number of serological studies on African populations has increased rapidly in the last three decades (Nurse, et al., 1975, Nurse, et al., 1977, Nurse and Jenkins, 1977, Nurse, et al., 1979; Jenkins, et al.,1970), particularly in the area of sickle-cell research (see Livingstone 1969, 1976; Mears, et al., 1981a, 1981b). The most recent and comprehensive serological overview of Africa by Excoffier, et al. (1988) discusses most of the Gm, Rhesus, HLA and mDNA information presently available. Principal component analysis was applied to data from literature reports to identify relationships produced by these various polymorphisms on a continent-wide basis. Each of the polymorphisms delineated five major biological clusters; Khoisan, Pygmees, Afro-asiatics, West Africans and South Africans (Bantus). Exact placement of individual groups within the major clusters varied between serological variables, and not all the same groups were included in each of the tests. The distributions are consistent with previous serological studies using other blood polymorphisms, and are commensuate with anthropometric and craniometric results.

Excoffier's group distinctions are also consistent with the linguistic relationships presented by Greenberg and Gutherie. The West and South African Bantu groups tend to be more closely clustered to one another, and distinct from the Afro-asiatics and Khoisan groups. The genetic affinities of these groups are thought to have occurred by gene flow during migrations of the western groups into the south. Homogeneity between these two clusters indicates the high incidence of shared genes between the south and west, despite a rather high degree of Khoisan admixture in other Southern African groups. It also reflects the relatively short time period since migration.

Craniometric distance and discriminant analysis of Sub-Saharan African tribes have primarily been done by Rightmire (1970; 1976). His studies have indicated metric and non-metric cranial traits separate groups into biological relationships, but slightly different from other biological data. His analysis identify two distinct clusters; Bushmen, Hottentots and Nama versus essentially all other Negroid groups. Intra-group relationships within the Negroid cluster are present, but the affinities are not clear enough to confirm identities. Rightmire's results align with Hiernaux's (1968) serological and anthropometric population distances. Distances between the Negroid groups indicated no distinct west and south delineations, only the separation of the Khoisan groups from all other groups.

J. Hiernaux's (1968) publication was a landmark work incorporating all serologic and anthropometric data available at that time, comparing the population correlations using a delta-g distance for biological affinities. The delta-g distances were calculated for both anthropometric and serological variables and then compared to geographic distributions. The distributions of the groups formed two essential clusters, Negroid groups of West and South Africa versus Khoisan groups. Pygmees generally associated with the Negroid groups although they were somewhat circumscribed within the Negroid cluster. Intra-Negroid cluster affinities followed regional boundaries, but the relationships were not consistent or strong.

It is well known that inter-observer error can profoundly effect results. In particular, studies based on data from literature reports are extremely subject to the effects of different formats for collecting or reporting the data as well as the influence of different observers.

Because Hiernaux relied upon literature reports for his analyses, the geographical and biological correlations were subject to these extraneous inter-observer effects and thus reduced the confidence levels of his results. Hiernaux was aware of the pitfalls of using literature data for comparative research, but as Rightmire pointed out, the magnitude of variation observed in their studies could not be attributed to observer error alone. They both concluded the multi-dimensionality of their data is too complicated to be fully interpreted by the methods used (delta-g). With the use of more sophisticated statistical models for analysis, clearer biological relationships may be formed, delineating smaller genetically similar sub-groups.

Dermatoglyphic Studies

Sub-Saharan Africa is probably one of the best dermatoglyphically studied regions of the world second only to the European continent. Finger, interdigital and palmar dermatoglyphics samples are available for almost all regions of the continent and allow individual intra- and inter-regional evaluations. By 1950, enough dermatoglyphic research had been done throughout Africa for Gessian (1957) to identify a continent-wide cline of increasing whorl frequencies from south to north. This cline has been supported in subsequent studies, becoming an accepted phenomenon in African dermatoglyphics. An east to west cline has also been suggested by Sunderland and Coope (1973) but has not been consistently supported by later analyses.

Other studies such as Jantz and Hawkinson (1979), Jantz and Brehme (1978), Jantz, Hawkinson, Brehme and Hitzeroth (1982), and Hitzeroth, Brehme and Jantz (1986) have shown general trends of dermatoglyphic inter-population correlations and have reflected those found in serologic, linguistic, and morphometric studies (see Hiernaux 1975; Talbot and Mulhall 1962; Bascom 1969; Hiernaux and Fromet 1976; and Lestrange 1953). From these studies the identification of regional cultural groups by dermatoglyphic means showed great promise. Results obtained by these investigators showed dermatoglyphics could reliably be used as an indicator of population affinity and variation among groups. Hiernaux's (1968) synthesis included dermatoglyphic results, and related them to the other anthropological analyses. But just as in the serological and anthropometric comparisons, some dermatoglyphic variables were inconsistent with expected genetic relationships.

Using different dermatoglyphic studies is hampered by nonsystematic guidelines for recording or presentation of the data. Earlier studies focused on the qualitative frequencies of pattern designs, using only the traditional arch, loop and whorl categories. This level of dermatoglyphic analysis severely limits the amount of information obtained because of its qualitative results. But despite their inadequacies, pattern frequencies are still reported more often than ridge-counts. Ridge-counting is a metric method to quantify epidermal variation. In the fingers or toes, 20 elements are available for counting; in the interdigital areas there are six fields available. It has become common practice to follow Holt's (1968) procedure, using only the larger of the two counts, collapsing the available information from 20 to 10 counts. Additionally, the Total Ridge-count (TRC) was also proposed by Holt where the 10 counts were summed producing one composite variable. However, Jantz (1979,1987) has indicated that radial and ulnar digital ridge-counts (both finger and toe) do not follow similar patterns paterns of variation. Thus by using Holt's method, this added variation is neglected and differences which may contribute to population distinctions is lost.

The use of dermatoglyphics as a means for population analysis is not new in biological anthropology. At the turn of the century, Galton (1892) and Wilder (1902) reported specific population tendencies in dermatoglyphic frequencies. These population specific relationships are thought to reflect early intra-uterine genetic influences since once dermatoglyphic features are formed by the fifteenth week (post conception), the pattern and number of ridges remain unaltered through an individual's lifetime. Environmental factors which generate plastic responses in an individual later in life do not affect dermatoglyphics, providing a constant phenotype which reflects some level of close genetic control.

The genetic basis and level of heritability in dermatoglyphics have been investigated by various individuals (Cummins and Midlo, 1926;1961; Jantz, et al., 1979, 1983; Holt, 1968). Using twin study research as a basis, these estimates evaluated monozygotic, dizygotic and intra-family correlations to determine the genetic control on dermatoglyphic features. Theoretically monozygotic twins would have a r=1.0 since the genetic material shared between them would be equal, whereas in dizygotic and sib-sib offspring, the r=0.5 because of shared parental genetic material. The actual relationships are similar but not equal to the expected values. Therefore, although environmental influences on the formation of dermatoglyphics are evident by discrepancies between real and expected correlations, the level of environmental effect is not to the magnitude found in other morphological features.

The level to which dermatoglyphics identify population affinities through genetic similarities has been the basis for many discussions. Melanesian population studies by Freidlaender (1975) and Froelich and Giles (1981a;1981b), have shown differing degrees of covariation with regards to other forms of anthropological genetic research (i.e., serology, anthropometrics). Freidlaender found very little correlation between dermatoglyphic group distinctions and those patterns produced by blood, anthropometric or geographic distances. In contrast, Froelich and Giles indicated that dermatoglyphics produced the clearest representation of expected structuring in their study groups. In a later study of the Melanesians, Dow, et al.(1987) also found significant patterning of dermatoglyphics to geographical and linguistic population structuring, contradicting Freidlaender's earlier conclusions. Freidlaender (1988) reinstates some confidence in the use of dermatoglyphics as indicators of biological relationships. Jantz and Chopra (1983), evaluating samples from India, also identified significant correlations between dermatoglyphics and other methods of population analysis but also found fluctuations between regional groups. A recent study by Rudan, et al. (1988:100) determined dermatoglyphics to be less influenced by evolutionary or migratory factors and reflect a better representation of ancestral relationships than than other anthropological means, again supporting confidence in dermatoglyphic analysis of populations. Other studies by Binkley (1985), Jantz and Brehme (1988); Hitzeroth, Brehme and Jantz (1986) have strengthened the confidence of dermatoglyphics as one anthropological method for determining population affinities, relationships and possibly migrations. Although dermatoglyphics can be used for population analysis, it must be remembered there will always be different levels of genetic reflection in populations due to inter- and intra-group variation.

The Scope and Purpose of the Present Study

In Jantz and Hawkinson (1979), dermatoglyphic diversity in Sub-Saharan Africa was evaluated using literature reports of finger ridge-counts. Holt's (1968) 10 finger ridge-count variables and total ridge-count (TRC) were used in a multiple regression analysis along with longitude and latitude, to determine if geographic patterns of distribution existed in finger ridge-counts. Geographic relationships in dermal counts were found, primarily described by between finger contrasts. They indicated there were some specific problems with the dermatoglyphic methods. The 10 finger ridge-count data set was adequate in producing significant patterns in the sample, but they suggested that the use of the entire 20 count data set would form a clearer understanding of group relationships. They also indicated a problem with inter-observer variation inherent in literature data. Differences in dermatoglyphic methods as well as analysis and reporting of results all restrict the use of previously published material. Literature based studied will never be eliminated, but with a systematically accepted method of analysis and reporting, more reliable analysis may be obtained from this material.

It is the intent of this study to pursue the problems identified by Jantz and Hawkinson in 1979 and evaluate the use of dermatoglyphics as a system for population study. The African continent was chosen for this analysis because of the existence of dermatoglyphic prints analyzed by one individual (Mr. H. Brehme) using a systematic protocol. Therefore, all the results produced from this study can be attributed to differences between group.

Population structure will be presented and evaluated using the most commonly accepted dermatoglyphic variables. The effectiveness of these various methods in forming population distinctions will be presented and interpreted. Four major avenues of investigation will be performed. First, canonical tests will be performed on the quantitative dermatoglyphic data to evaluate the significance of the group differences produced by the African groups. Secondly, principal coordinate analysis will be used to generate graphic distributions of the inter-group distances and to identify the dermatoglyphic variables responsible for these patterns. Thirdly, through D-square distance matrix comparisons, correlation tests of the quantitative and qualitative dermatoglyphic methods will be compared to identify their interpretive abilities on the African data sets. At this level, language and geographic distance matrices will also be compared to the dermatoglyphic distance matrices to evaluate their distributions to cultural and environmental distinctions. The final step is to compare the African dermatoglyphic results to previous anthropometric, serologic and craniometric African population studies to see the extent to which dermatoglyphics to conform to other forms of biological group structure analysis.

It is not in the scope of this study to identify micro-differentiation between all African populations. This thesis is designed to identify and discover continent-wide relationships through various dermal variables and to compare these results to geographical and cultural (linguistic) relationships between the tribes. Particular inconsistencies brought out in this analysis will require further regional dermatoglyphic study to clarify the unexpected group patterns. These group relationships would change with the elimination of variation produced by groups from other geographical regions, or by the exclusion of small sample size groups. It is hoped the results from this study will illustrate the utility of various dermatoglyphic methods, and lead to the standardization of methods for dermatoglyphic research.

II. SAMPLES

The tribes and sample sizes used in this study are listed in Appendix A. Because the tribes are widely distributed geographically, the background information below will be subdivided into five regional geographic areas to facilitate organization: West Africa (encompassing the western coast to the western Congo basin), Central Africa (including the eastern Congo basin and tribes from the eastern plateau), South-west Africa (comprising the Angolan region tribes), South Africa (South African "urban" tribes) and Madagascar. Several culturally related tribes, living in close proximity to one another, were often collected by one investigator. In these cases, the tribes are presented together since their cultural background and literature citations are the same. Otherwise the groups will be presented in alphabetical order within their specific regions. Descriptive dermatoglyphic summary statistics are provided for each tribe in Appendix B.

West Africa

BAB Babongo-Pygmees
BAK Baka(h)-Pygmees
BKO Bakolah-Pygmees

The Bakolah used in this study are identified in the dermatoglyphic analysis by Dankmeijer (1947). They were collected by Julien on a visit to the Congo basin of Cameroon in 1937. Dankmeijer (1938) also describes a series of other Pygmees collected by Julien from French Equatorial Africa called the Bayaka (Babenga). The names are similar to the other two groups used in this study but the sample numbers do not directly coincide as in the Bakolah. It is probable that these are the same samples described by Dankmeijer (1947). Burssens' (1958) ethnography of the NgBaka from North-west Congo may be the same Baka tribal group as Julien's sample from South Cameroons but no specific reference is made by Burssens. Craniometric studies on Central African Pygmees by Poutrin (1910, 1911, 1912) include these groups.

BAG Baga

The Baga were collected by W. Herz approximately 300km north of Konakry, near Taidi and Binari, French-Guinea on a 1959/1960 West African Expedition. Finger and hand dermatoglyphic analyses were reported by Tillner (1967) and were compared to other reported West African samples.

The Baga have held a strong political alliance with the neighboring Susu since European contact, and were believed to have been present since the beginning of chiefdoms in West Africa. Gene flow is recorded with Muslim salt and rice traders and with the Landuma and Nalu tribes. After about 1700 political alliance with the Fula and Simo strengthened the cultural position of the Baga in the West African coastal region (Mouser, 1980:497-499).

BAM Bamileke

This sample was collected by Legrand in 1967 at two schools in Bangwa, near Bangangte, Cameroon. Finger and palm investigations have been published by Glanville (1968) and Wangermez and Lamontellerie (1974). Anthropometric results were presented by Olivier (1947a; 1947b) and used for comparing the Bamileke to other Bantu groups in a study by Talbot and Mulhall (1962). The results from the later study indicate the Bamileke are most similar to the Bantoid populations of the Adamawa Highlands of Cameroon, sharing similar broad head and face measurements. Ethnographic data were published by Dugast (1949) and by Tardits (1960). Serologic study of the Bamileke has been done by Henninot, et al. (1958) and Happi (1959), and group comparisons of sickle cell frequencies were done by Becquet, et al (1959). The serological findings indicate that the Bamileke are similar to the Shi-Hunde-Swaga groups found west of the Great Lakes in Zaire. The frequency of the s allele in these groups is lower than that found in Cameroon groups.

BAO Baoule

This population was collected at two primary schools in Adahou and K'Puoebo, south-west of Dimbokro, Ivory Coast, in 1971. Finger and palm pattern investigations were reported by Rigters-Aris (1975a; 1975b). The Baoule are the western extension of the Akan speakers in West Africa, interconnected with the central Akan and Kru, southern Mande and Voltaic, the Ashante and the Dyula through important trade networks of gold, textiles and European goods. The Baoule held a high status during early European contact because of their skills in trading. But as French controls increased in the Ivory Coast, restriction of the Baoule power lead to resistance by the tribes. In the late 1800's and early 1900's, the Baoule "slave labor" agricultural system was halted by the French, instigating revolt. After settlement with the French, the Baoule reinstated their trade practices under colonial rule, incorporating industrial items such as rubber and palm-oil (Dumett, 1980; Weiskel, 1980).

BOZ Bozo

The Bozo were collected in Mali but no further information of the investigator, date or specific region of collection is available. In the literature research, no dermatoglyphic discussions of the Bozo have been found.

BWA Bwaka

The Bwaka sample was collected in Libenge, Zaire in 1949. Finger and palmar pattern frequencies were evaluated by Vrydagh- Laoureux (1977; 1979) but no further information was given about this particular population. The geographic position of this group suggests these people are part of the western Congo basin Pygmee groups.

DOG1 Dogon-Boni
DOG2 Dogon-Sanga
DOG3 Dogon-Sanga

The Dogon samples were collected during the Tellem Expeditions of 1964-1966. The sample from the Sanga village come from the center of the Dogon region while the Boni sample comes from the village of Banaga on the eastern periphery of the Dogon region in eastern Mali. Digital dermatoglyphics were described by Huizinga (1965) and Glanville and Huizinga (1966a;1966b). They indicated that the Ful and Dogon have similar total ridge-count, but it remains to be seen whether the finger by finger ridge-count values are also equivalent. Anthropometric analysis has been done by Huizinga and Birnie-Tellier (1966). Previous study of the Sanga Dogon had been done by Gessain (1957) and were also included in Sunderland and Coope's (1973) Ghana study. A skin reflectometry study of the Dogon has been done by Ignazi (1966). Using craniometric analysis on a series of excavated skulls from the Dogon-Kurumba region and modern Dogon, Huizinga (1968b) doubts the archaeological population represents antecedents to either the Dogon or the Kurumba, but suggests the now existent tribes are more recent migrants to the region. A separate craniometric study (Leschi, 1958) using crania from two cemeteries, a recent collection from Bara and an older sample from Toloy, found discrepancies between the different time periods. A follow-up study in the next year (Leschi, 1959) compared the crania to a sample of Niger Negroids, finding the later crania to be more similar, agreeing with Huizinga's suggestion that the now present Dogon are more recent implants. Bedaux's (1980) study of footed bowls in the "Tellem" region also suggests from archaeological evidence that the Dogon have migrated from the Mande region to their now present regions. This is in support of oral tradition studies indicating the Dogon migrated before the fifteenth century (Griaule, 1938). Huizinga

(1968a) evaluated several biological anthropological variables of the Dogon, Fulani, Foulse and Fali to identify differences between the groups. Schrieder's (1963) findings for a high weight/surface ratio in Western Africa area is not in agreement with Huizinga's conclusions. The Dogon and the Kurumba significantly differ in leg length and in head and face morphology as well as in skin reflectometry Interestingly, the dermatoglyphic findings of Glanville, et al. (1966b) and Glanville (1967) do not indicate the extreme differences found in the anthropometric data.

DYO Dyola

This sample consists of school children from Casamance, Senegal, printed by Sypkens Smit. The dermatoglyphic analysis is published by Leschi (1948). The Dyola (Diola) are a non-Mande West African coastal ethnic group from Senegal not to be confused with the Dyula of the Upper Niger region (Perinbam, 1980:455). Sub-groups of the Dyola are the Baiote, Balante, Biafade and the Kasanga all found south in Portuguese Guinea. Anthropometric comparisons of these groups show moderate differences (Hiernaux, 1975:160-1) supporting Greenberg's (1966) linguistic classification of these tribes into one group, along with the Tenda and Wolof of Senegal.

FAL1 Fali-Toro
FAL2 Fali-Kangou
FAL3 Fali-Tinguelin

Fali samples were collected in 1968 and 1970 on anthropological expeditions to Cameroons under the direction of J. Huizinga, then director of the Institute of Human Biology, Utrecht. The Toro and Kangou groups were collected at Toro while the Tinguelin sample was increased by individuals collected from the villages of Ngoutchoumi. Digital and palmar dermatoglyphic studies have been done by Glanville (1968) and by Rigters-Aris (1975a; 1975b). An overall morphological study of the Tinguelin Fali was done by Gauthier and Wangermez (1964). Ethnographic reports were published by Gauthier (1969) and Lebeuf (1961) and physical anthropological analysis by Huizinga (1968a; 1968b), Huizinga and Rejnders (1974a;1974b) and Rigter-Aris (1973). The North Cameroon region has continually been invaded by peoples from the north and east, particularly by the Fulani during the 18th and 19th centuries. Therefore, the present Fali are quite different from the indigenous Fali prior to the 17th century (David, 1980:154). Lebeuf (1961) indicates the Fali show mixtures of northern and southern ethnology, linguistics and oral tradition supporting the idea of long periods of social and genetic population interaction.

FOU Foulbe

This Foulbe sample is alluded to but not discussed in depth by Huizinga (1968a). The "Fulani (Foulbe or Peul) tribe" are situated north-east of Hombori and live in smaller size groups in close proximity to one another (Huizinga 1968a:357). These peoples are probably part of the western extension of the Fulani intrusions into more southern regions after about 1700.

FUL Fulani (Peul)

This sample was gathered from the area around Boni, Mali during 1964-1966. Finger and palmar dermatoglyphics are described in Glanville and Huizinga (1966a;1966b). Comparisons of the Peul, Dogon and Kurumba in Glanville and Huizinga (1966b) indicate there is continuity in the dermatoglyphic features of these samples. The Fulani of today are considered to be a classic example of racial admixture, containing Caucasian, Mediterranean and Negroid ancestral stock. Importance is attached to lighter skin, straight hair and narrower nose and lips, distinguishing them from their more Negroid neighbors. Although these features are considered most desirable by the Fulani, the population covers the complete range of physical variation from very Negroid to very caucasoid (Stenning, 1965). While many ethnographers consider the Fulani as part of the northern intrusion of Muslims into central West Africa (David,1980:155), Greenberg (1966:43) contends the Fulani are part of the Niger-Congo family and do not have any positive evidence of Hamito-Semitic structure to their language. The Fulani were a massive invading force into the Northern Cameroon area, and have had several centuries of intermixture with the indigenous Fali. The spread of this population is also seen further west in the areas of Mali and Upper Volta. In this area the Fulani have been identified as Fulbe (Foulbe) by the Germans and Peul by the French.

KIR Kirdi

This sample of Kirdi was collected by Julien in North Cameroons but no place of observation or date of collection was reported. No specific identification of this tribe has been made in any of Julien's reports, either because he incorporated the Kirdi into a larger group, or never analyzed the data.

KUR Kurumba (Foulse)

This Kurumba sample was collected in 1966, with additional prints obtained in 1967 during the Tellem Expeditions to Roanga and Yoro, Upper Volta. Studies include dermatoglyphic investigation of the fingers and palms (Glanville and Huizinga, 1966b) and (Glanville, 1967), physical anthropology (Huizinga, 1968), blood pressure (Huizinga and Bernie-Tellier,1967), and vital capacity (Huizinga and Glanville, 1968). No major differences were found between the Kurumba dermatoglyphics and the surrounding groups of Peuls and Dogon. A craniometric study done by Huizinga (1968b) indicated that the Kurumba and Dogon are not similar to the prehistoric inhabitants, suggesting the now present groups are more recent migrants to the Tellem region. Huizinga (1968a) found significant differences between the Kurumba and the Dogon in several anthropometric variables, particularly in extremity length and head morphology, disagreeing with the dermatoglyphic results. The Kurumba were included in Sunderland and Coope's (1973) comparative study of Ghana dermatoglyphics to other West African tribes, but no discussion of their particular relationship was made.

KUS Kusasi

Collected in 1970 by Rigter-Aris during a stay in Ghana, the sample comes from Garu, 25km south of Bawka, Ghana. They are included as part of the dermatoglyphic analysis of the Fali and Baoule by Rigters-Aris (1975a; 1975b).

MAM Mama

The Mama were collected in east Nigeria by Julien but no report of the date or specific region is reported. No dermatoglyphic reports been found for the Mama by Julien or any other investigator.

SAS Samo du Sud

This Samo du Sud sample was collected at Yaba, Nimina, and Siena, Upper Volta by Huizinga and his collaborators. No data or descriptions have been found to identify the date or extent of collection. If they have been previously analyzed, they were incorporated into a comparatively larger regional group and not described separately.

YOR Yoruba

This sample was collected by Mrs. A. Kalmus in 1974 from several University of Ife biology classes. Female samples were increased by acquiring additional prints from grammar school girls. Various dermatoglyphic investigations have been done on this sample by Jantz and Brehme (1978), Jantz and Parham (1978), Jantz and Owsley (1977) and Jantz (1977). A serologic study of the Yoruba has been done by Garlick and Barnicot (1957). Red cell enzymes of a Yoruba sample (Ojikutu, et al. 1977) were compared to South African Negroes of similar urbanization level. The results indicated the South African Negroes were similar to one another, suggesting Yoruba ancestral divergence. The differences between the Northern and Southern populations found in this study were attributed to the differing amounts of Khoisan admixture in the South African Negro gene pool. Jantz, et al., (1982) found the Yoruba to cluster with South African Bantu groups in a finger ridge-count analysis. They suggested this was an indication of common ancestry of the Bantu-Speakers in the South with those of West Africa, supporting the late Bantu expansion theory.

The Yoruba peoples are what is left of one of West Africa's largest and oldest kingdoms. Ethnic identification is still quite strong in Ife, with urban separation of the various sub-groups of the kingdom. Linguistically, the dialect spoken by the Yoruba is considered to have about a 1000-2000 year separation to neighboring and Eastern Bantu dialects, comparable to the difference between the English and Russian languages (Lloyd, 1965:580).

Central Africa

AKA Aka-Pygmees
BAS Basua-Pygmees
EFE2 Efe-Pygmees

These three Pygmee samples were collected in 1934 by M. Gusinde on a grant from the Wenner-Gren Foundation. The Aka were collected in the region North of the Ituri River, the Basua at Abfango, Zaire, and the Efe at Mabili and Matangba, Zaire. Dermatoglyphic analyses were first reported by Cummins (1955) and then compared to other dermatoglyphic samples by Geipel (1948; 1956). These Pygmee samples were included with the Efe in comparative relationship studies done by Dankmeijer (1938) and Rife (1953) using finger pattern frequencies as variables. He found the Pygmee samples to have the lowest whorl frequencies of any samples and the African groups, clustering by themselves when contrasted to Caucasian and Indian samples. A work capacity study (Austin, et al., 1979) using the Twa and Nbuti in comparison to Bantu samples showed a decrease in absolute aerobic capacities in the Pygmee groups. It is pointed out in Turnbull (1965a;1965b) the terms Aka and Efe are names given by Schebasta (1938) and are not those actually used by the Pygmees of the Ituri themselves. Turnbull identifies the distinctions made between the Ituri peoples as merely linguistic. The group distinctions are a reflection of association with invading Sudanic- and Bantu-speakers into the Ituri forest region. The Bira (Bantu)are from the south, the Lese (Sudanic) from the east, the Mangbetu (Sudanic) and Zande (Adamawa) from the north-west and the Mamvu-Mangutu (Sudanic) from the north. Craniometric studies done by Poutrin (1910;1911;1912) include the above groups.

EFE Efe-Pygmees

These prints were collected during the 1930's in the Ituri forest region between Andudu and Mbasa, Zaire. Pattern types were described by Dankmeijer (1938 and 1947) and ridge-count analyses done by Glanville (1969). Glanville made comparisons to Kurumba, Dogon, Peul, and Fali in total ridge-count and pattern intensity. He found that the Efe have the lowest TRC recorded for any African population (and possibly the world). Rife (1953) used these Pygmees along with those described by Geipel in a comparative evaluation of finger print frequencies on ethnic relationships. In the overall study, Rife found the Pygmees to be more similar than other Caucasian and Indian groups, but commented on the low frequency of whorls found in the Pygmee samples. A serological study done by Fraser, et al. (1966) compared an Efe Pygmee sample to two other Congo populations. The Pygmee groups were more similar to one another than the Bantu-speaker they were compared to, but the Pygmee groups had closer serological association to the particular Bantu group in which they shared social and trade interaction. The results of this study agreed with other serological analyses of the Congo region done by Jadin (1935; 1963) and Hiernaux (1962). Turnbull (1965b:22-23) identifies the Efe as part of one pygmoid people of the Ituri region. He states the distinctions between the Aka, Efe, and Mbuti were made on linguistic grounds by Schebasta (1938) and did not appear to be based on biological criteria. Volume 78/4 (1989) of the American Journal of Physical Anthropology is devoted to the recent research done after 1980 on the Efe and Lese under the Ituri Project.

HEH Hehe

This sample was collected by A. Redmayne in the early 1970's at upper primary and secondary schools in Uhehe, Tanzania, part of the Iringa and Mufindi districts. The majority of the sample comes from tribes centered in Kwakalinga and Igarilo, south-central Tanzania. Finger and palm dermatoglyphic analysis was published by Roberts, Chavez and Redmayne (1974).

LES Lese(Balese,Mlese)

These samples were collected by Gusinde in Zaire but no collection date is recorded. The MLese-MButi were collected at Kurubu while the Lese came from north of the Upper Ituri River. Ethnographic study of the Mbuti Pygmees has been done by Turnbull(1965a;1965b). Turnbull points out (1965b,pp. 22-23) that racially, all Pygmees from the Ituri forest are one group. Linguistically the groups may be different, but this is due to incorporation of the languages of the different invading Negro tribes into their specific areas: the Aka invaded by the Ngbetu/Zande, the Efe invaded by the Lese and the Sua invaded by the Forest Bira (Schebasta, 1938). To the Pygmees, tribal differentiation is determined by geographic placement of the tribes rather than by descrete tribal identification as done by Schebasta. Anthropometric comparison of the Mbuti Pygmees to the Twa(Cwa) by Hiernaux (1966) found the two groups to be divergent due to different environmental influences on body build. Poutrin (1910;1911;1912) includes the above groups in his craniometric analysis of the Central African Pygmee. Volume 78/4 (1989) of the <u>Journal of Physical Anthropology</u> contains several papers from a symposium organized by Peter Ellison and R. Bailey concerning the research on the Lese and Efe done under the Ituri Project, started in 1980.

MAN Mangbetu

These data were collected by Guisinde in north-east Zaire, but no recorded time or place is given. It could be assumed these individuals were collected during the same time as all the other groups in Zaire (1957). Dermatoglyphic investigation published by Geipel (1964) shows the Mangbetu to be part of the invading eastern Sudanic speakers into the Ituri forest region. Their relationships to the Mbuti Pygmees have led to gene flow between these groups and incorporation of the Sudanic language by the Pygmees.

SUK Sukuma

No investigator is identified for the Sukuma sample comprised of school children collected south of Lake Victoria. However, since the prints are housed at Newcastle, it may be assumed they were collected by some British expedition to that region, possibly by D.F. Roberts, et al.. An ethnographic study of the Suk(uma) has been done by Beech (1911). Beech indicates (p. xiii-xv) that because of their lack of homogeneity or tribal affinity, the Suk are a composite people including physical, cultural and linguistic traits of all the other East African tribes. He believes, however, the origins of the Suk are Pygmoid in nature (p. 2). Brothwell (1963) believes the contrary is true. In his physical anthropology study of the Sandawe and Hadza, he compares these groups to the Sukuma and Nyaturu Bantu tribes suggesting that the amount of Bushman ancestry in the gene pool is not great. It may be that Brothwell has assumed the Bantu groups (Sukuma) are indicative of later arrivals to the south-east and therefore should not have a high Bushman admixture. If Beech is correct, the comparable physical type between Brothwell's groups may indicate similar amounts of Khoisan admixture.

South-West Africa

BIE Bieno
CHO Chokwe(Quioco)
GIN Ginga
LUI Luimbe

These Angolan samples were collected by H. Brehme in 1971. The Bieno were collected in Silva Porto and Luimbe in Ganda, central Angola and described by Brehme (1972a). The Chokwe were collected in Dundo (north-east Angola) and the Ginga collected in Malange, (central Angola) The samples described by Brehme (1972b) have been subsequently used in comparative dermatoglyphic studies (Jantz, et al., 1982; Hitzeroth, Brehme and Jantz,1986). An anthropometric analysis using these groups along with other south west

African groups has been done by Knussmann and Rosing (1974). The Bieno and Luimbe cluster in their own subgroup (Bie-cluster) while the Ginga and Chokwe are part of a larger Negroid cluster to which the Bie cluster attaches (Knussmann and Rösing, 1974:150). Blood group analysis has been done on the Chokwe by Spielmann, et al. (1973) finding the Angolan groups closely related to each other (Ambundo, Ovimbundo and Luanda-Tchokwe), and further separated serogenetically from Caucasians than Mozambique Negroids.

BUS !Kung-Bushmen

This Bushman sample was collected in 1982 from north-eastern Namibia around Tsumkwe in the Kalahari desert. Digital and palmar dermatoglyphics are described in Hrezcko and Roberts (1985). The study found interdigital count reduction in areas a-b and c-d thus allowing increased b-c counts. A higher frequency of digital arches was also evident. Dermatoglyphic studies on other groups of the !Kung have been done by Tobias, et al. (1961). Serological and other biological analysis of these same groups were conducted by by Jenkins (1966) and Jenkins and Steinberg (1966). Another anthropometric study using a different Bushman sample was done by Gusinde (1953). An overall serogenetic analysis of San tribes in south-west

Africa by Nurse, et. al. (1977a) found the San groups to be more closely related to one another, irrespective of language differences between the North and Central !Kung, and more closely related to Khoi groups than to other Negro groups, even though both are separate and distinct biological groups.

CUA Cuanhama

Dermatoglyphics relationships of this group are analyzed along with various other Bantu groups from south Angola by Matznetter (1967). There is no reference made to the collector or when this group was studied, so this may be a different sample than that made by Julien in the 1930's. Matznetter's group was collected at Perira d'Eca in south west Angola. These individuals make up the Angolan compliment of the Ambo tribe of Owambo (Hitzeroth, 1976a:213). Anthropometric analysis of the nose and head have been done on the Cuanhama by and Weninger and Schieber (1974;1975). Frequencies of arterio-sclerosis is discussed in Aschner and Weninger (1967). The Cuanhama are included in Hitzeroth's (1976a;1976b) Tjimba anthropometric and dermatoglyphic analyses. The results of these studies indicate the Cuanhama are similar to other South African groups in both dermatoglyphic features and in body size and shape. The Cuanhama (Kuanyama) are part of a distinct Bantu group in the south-west including the Kuangar, Himba, Herero, Kuambi and Mbukushu. Khoisan admixture fluctuates among the groups considerably, reflecting differences in the amount of association with the Khoisan (Hiernaux, 1966:109). The Cuanhama (Kuanyama) have about 5% admixture. Although the Herero and the Cuanhama are linguistically similar, they differ in head and face size, probably a response to gene pool differences (Khoisan admixture) and to environmental factors since the Herero are pasturalists in more arid regions while the Cuanhama are more sedentary agriculturalists.

South Africa

NDB Ndebele
PED Pedi
SHA Shangana
TSW Tswana
VEN Venda

These groups were collected in various primary schools in Pretoria, Republic of South Africa (R.S.A.). Finger and palm dermatoglyphic analyses have been described by Brehme and Hitzeroth (1979;1980). Serogenetic analysis has been done using 6 serum protein polymorphisms (Hitzeroth and Hummel, 1978) and 24 polymorphic variables by Hitzeroth (1986). In comparison to Zulu and Swazi, the above groups divide into three statistically separated groups; one group includes the Ndebele, Pedi and Tswana, the Zulu and Swazi into a second group and the Venda and Shangana into a third distant sub-cluster. According to Hitzeroth, these separations are due to the various levels of Khoi-San admixture in the different tribal groups. An additional comparison and discussion using the dermatoglyphic and anthropometric data are made in this text. Analysis of G-6-PD polymorphisms and the Malaria hypothesis has been discussed using these South African groups by Hitzeroth and Bender (1980). Other blood polymorphism studies have been done by Mauff, et al. (1976) finding several rare or previously unknown polymorphisms in the South African groups, especially in the Ndebele and Tswana. Bender, et al. (1977) found differences between the Swazi compared to the Pedi and Venda in GLOI frequencies and Hitzeroth, et. al. (1976) found the South African samples to be comparable, yet separate from Swazi and Western African samples using Es D polymorphism. Reys, et al. (1970) found the Shangaan G6PD frequencies to reflect tribal isolation and drift different from other southeastern Bantus. Using genetic distance analysis from a set of isoenzyme polymorphisms, Hitzeroth, et al. (1981) found a North(Pedi) and West Sotho(Tswana)-Ndebele cluster, a Swazi-Zulu cluster and

Shangana and Venda more distant sub-groups. Hitzeroth attributes these affinities to geographical proximity and ethnic origin/descent. A separate serological study using different samples of the same groups was done by de Villiers (1972) with similar results. A craniometric study done by Rightmire (1976) identifies the Venda as different from other South African Bantu groups. Rightmire suggests the difference is possibly because the Venda originated from a group which moved from the Transvaal into the Sotho region and remained circumscribed to admixture with the Southern Negroids and Khoisan.

Madagascar

AOY	Antandroy	Ambaroe, Embanisangi
ASY	Antanosy/Tanosy	Ampasimena, Manevy
BEO	Betsileo	Fandriena, Soatanana
MER	Merina (Hova)	Tananarino
SDN	Sakalava du Nor	Marovato, Antifiabe
TAN	Tanala	Ambalavao, Karianga

These Madagascaran groups were collected by Nyessen. All dermatoglyphic descriptions of the hands and feet were reported by Geipel (1957;1958). A study using a different collection of dermatoglyphics including all the above groups except the Tanala and Sakalava was done by Chamla (1957). This study analyzed pattern frequencies and main line endings evaluating the extent of indian admixture through these features. Anthropometric and serological study of Madagascaran populations including those above was done by Singer, et al. (1957). Madagascar and its people have been studied by only a few scholars, leaving many questions about the history and development of Madagascar to speculation. Linton (1933) made an expedition to Madagascar under the financial support of Marshall Field, studying all the major tribal groups, but especially the more archaic Tanala. Kent (1968a;1968b) wrote a series of articles on the history and development of tribes in Madagascar in response to this void in African studies, specifically studying the Bara and the Sakalava. Both Linton's and Kent's studies were ethnographic in nature and did not contain any in-depth physical anthropological comparisons.

III. METHODS

Means, standard deviations, maximum and minimum values were obtained for all the groups to check for data entry or recording errors. The data sets were then converted into distance matrices and applied to canonical analysis, principal coordinate analysis and D-square distance correlation analysis.

Dermatoglyphic Protocol

All dermatoglyphic pattern identifications and ridge-counts were performed by one investigator, H. Brehme of the University of Freiburg, Germany. Professional correspondence between Mr. Brehme and R. L. Jantz has lead to an impressive data bank of completely analyzed hand, and in many cases, foot dermatoglyphics. At this time approximately 30,000 individual's prints are on computer file at the University of Tennessee, Knoxville, consisting of over 180 world-wide ethnic groups.

Finger pattern classifications are made following standard methods outlined by Geipel (1935), and Cummins and Midlo (1961). Mr. Brehme's dermatoglyphic pattern list identifies 25 separate finger pattern types. To make the pattern frequency investigation in this study more equivalent to previous pattern type studies, pattern frequencies were consolidated into the four traditional categories; arches, ulnar loops, radial loops, and whorls.

The presence or absence of pattern designs were determined for the five major fields of the palm: Hypothenar, thenar and the three interdigital areas. Mr. Brehme uses an exacting classification system for palmar pattern analysis. As was done for the finger patterns, only those patterns considered to be typical for that area are included in the frequency means for the present investigation.

Finger ridge-count analysis was performed following the methods described in Geipel (1935), Brodhage and Wendt (1951), Cummins and Midlo (1961) and Holt (1968). The 20 count analysis includes both radial and ulnar counts while the 10 count analysis uses only the larger of the two counts as described by Holt (1968). The 10 count method is believed by Holt to quantify finger pattern size without the need for data manipulation of all 20 counts.

It has been shown in several previous principle component analysis studies using 20 finger ridge-counts (see Jantz and Hawkinson, 1980; Jantz et al., 1982) that the first component is generally positively weighted for all variables while the second component is generally a radial versus ulnar contrast with one of the two sides being negatively weighted. To contain this pattern in the principle components, this study will use 10 radial plus ulnar (R+U) variables to contain the overall summed relationship of the first component, and 10 radial minus ulnar (R-U) variables to form the contrast pattern of the second component. Hopefully, this logical extension of dermatoglyphic ridge-count relationships may better quantify the variable relationships present in finger ridge-counts.

Ridge-counts for all 6 of the interdigital areas were analyzed following methods set forth by Baitsch and Schwarzfischer (1959). Traditionally, only the A-B counts have been reported, partially to avoid the problems with identifying missing C triradii. Baitsch and Schwarzfischer (1959) also presented a logical method to estimate the missing C triradius, and this method will be employed if needed. Palmar ridge-counts have become more widely studied since recent studies have shown racial and population differences (Jantz and Parham, 1978) and covariation between interdigital counts (Jantz, et al, 1987).

Geographic Distance Generation

Great circle distances, measuring inter-group distances across the arc of the earth, were derived by the equation (Spuhler, 1972):

$$COS(Dist.)=(SIN(X1))(SIN(X2))+(COS(X1))(COS(X2))COS(Y1-Y2)$$

1 deg.=60 nautical miles or 111.12 km.

where X1 and X2 are the two latitudes for the groups and Y1 and Y2 are the two longitudes. This method includes the added distance along the arc of the earth's sphere rather than straight cord distance as calculated by normal trigometric equations. Latitudes and longitudes used in this study were rounded to the nearest whole integer degree therefore making the first minimum distance greater than zero equal to 111 kilometers. This value is acceptable for the overall comparison of these African populations since the majority of the tribes used are geographically distinct enough from one another not to cause drastic loss of inter-group associations.

Linguistic Distance Matrix Formation

Linguistic distances are also evaluated in this study. Language identifications of most all the tribes were obtained from the ethnographic reports of the samples, and categorized following Greenberg's (1966) linguistic classification, since it is the most widely accepted linguistic classification model at this time. Linguistic distance matrices were generated following Sokal (1988) using a 3 tier distance of phylum and family identifications. If two languages are in the same family their "distance" is 0. If they belong to different families but in the same phylum, the "distance" is 1, and if they belong to different phyla the "distance" is 2. This form of linguistic relationship may be an over-simplification of the true glottal relationships of the groups, but as Sokal (1988:1724) expresses with regards to European linguistic separation, " more refined distances based on estimated times of separation had not shown appreciably different results from the trinary distances".

One must be aware of the inherent problems in using linguistic associations as identifications of population relationships. Glotto-chronological histories are based on shared words in an identified lexicon. In cases where a new language has been accepted by a culture, no identification of the original aboriginal linguistic stock is made. Disparity between glotto-chronological and biological comparisons with this miss-identified group to other similar linguistic groups may not be correctly interpreted. Archaeological and linguistic cultural relationships are often confounded since the replacements of language and culture usually are synchronic. But this same relationship is not borne out in the biological record. Gene flow assimilates both the new and the old characteristics, forming a conglomeration of features reflecting aspects of both backgrounds. Just as gene flow can pass over geographic barriers, so it does with language barriers (see Sokal, et al., 1988). Linguistic boundaries can be used to identify cultural groups and biological differences. But the biological relationships are generally much more indicative of population movements or restrictions than are cultural identities.

Canonical Analysis

There are three major applications to canonical analysis, 1) test of the null hypothesis that group centroids are equal, 2) low dimentional level graphic representation of distances, and 3) group classification. Graphic representation of group distributions will be made later through principal coordinate analysis. It is not the design of this study to discriminate individual groups from one another, so canonical discriminant analysis will not be used.

In this study, canonical analysis is used as a test of significance. A group of orthogonal vectors is generated to pass through the least square distance between group centroids. Significance in the tests (by Wilk's lambda) are valid when inter-group variation is greater than intra-group variation separating particular groups from one another along the vectors. The groups are weighted by sample size to reduce the erroneous information formed by small numbers in a group.

The first canonical vector describes the most significant variation observed between the groups means. The remaining vectors carry decreasing importance in the overall structure of the group separations, but often show interesting distribution patterns based on contrasting features in the data.

Principal Coordinate Analysis

As described above, vectors produced by the canonical analysis can be used to graphically represent the group distributions where the group centroids are weighted by sample size. Although this generally aids in controlling distribution distortion in small sample groups, it also may give undue power to groups with large sample sizes. In principal coordinate analysis (Gower, 1972:11), a systematic standard Euclidean distance matrix is first needed with elements d_{jK} of n size and a central diagonal of zeros. A matrix E, is then produced with elements $-1/2d^2_{jk}$. Using $e_{.k}$ for row, $e_{j.}$ for column and $e_{..}$ for general means of E, a new matrix F with f elements by the equation:

$$f_{jk} = e_{jk} - e_{j.} - e_{.k} + e_{..}\ .$$

Latent roots (Λ) and vectors (X) of F are obtained where the latent roots are the diagonals of F and should be decreasing in size. The columns of X are then scaled so the sum of squares of the ith column are the largest ith latent root. The elements of the i column of X are the principal coordinates for the group pairs of i.

An initial test of any observable variability was made between canonical and principal coordinate plots of the 20 and 10 finger ridge-counts by producing bivariate distribution plots of the first two vectors, showing little difference between the locations of the groups in the two plots. In order to utilize the positive aspect of equal weighting rather than sample size weighting, principal coordinate plots were used to graphically represent group distributions.

D-square Distance Matrix Comparisons

D-square matrices were calculated for each of the sexes in each of the different dermatoglyphic methods following standard Mahalanobis methods:

$$D^2_{jk} = (\bar{x}_j - \bar{x}_k)' W^{-1} (\bar{x}_j - \bar{x}_k)$$

where $\bar{x}_j$ is the column vector of means of j population and within-population pooled matrix W (Gower, 1972:2). Groups with a sample size larger than 20 individuals were included in the data sets. Although this is slightly lower than is optimal for accurate statistical analysis, this sample size was chosen to be able to include as many geographically and culturally different groups as possible. The smaller sample size groups did not have significant deviations, and thus were retained for analysis.

D-square matrix comparisons were done following Dow and Cheverud (1985:369) and Dow, et al. (1987:344-346). Initially, a Pearson correlation is obtained between the homologous elements of the two matrices. This correlation identifies the similarity between the two matrices. Then the columns and rows of the second matrix are randomly permutated into a new matrix and the correlation recomputed. This permutation of the second matrix and re-correlation is repeated for a designated number of times to generate a series of correlations to be compared to the original Pearson correlation. These random permutations test the null hypothesis of r=0 through this null distribution set. For this analysis 100 permutations were made generated place the significance test at the $p < .01$ level. The number of randomly permutated correlations greater than the original identify the level of significant difference between the two distance matrices.

The D-square matrix comparisons required three distinct levels of analysis. In many cases, few female dermatoglyphic prints were collected, Thus, the initial matrix comparisons contained 46 male groups and 35 female groups, allowing only intra-sex distance matrix comparison. In order to allow inter-sex distance comparisons, those male samples not haveing a female counterpart were dropped to make equivalent matrices resulting in 34 finger data groups, and 31 palmar data groups. Because palmar prints were not as systematically collected as finger prints, the third matrix comparison level required removing the finger data sets which had no associating palmar data. A final set of matrices containing 29 groups was used to make complete inter-dermatoglyphic and sex distance correlations.

Canonical and principal coordinate analysis and plot formation were all done on the main-frame system at the University of Tennessee, using SAS and IML matrix language packages All remaining statistical computations, matrix formation, D-square comparisons and tests of significance were performed on an IBM PS2-50 or Leading Edge Model D micro-computer using BASIC programs designed or modified by R. L. Jantz and myself.

IV. RESULTS

Finger Ridge-Count Results

Significance Test of 20 Counts

Canonical analysis results from all 20 ridge-count variables for each sex are presented in Tables 1 and 2. In the males, seven canonical vectors are above the 1.96 normal deviation significance minimum. The first two vectors contain 34% of the total variation found between the 46 male groups. The next five significant vectors each contain less than 10% of the remaining variation. Although

The the first two canonical vectors best illustrate the variation between the groups. Following the results found in previous dermatoglyphic studies, the first vector is controlled by overall pattern size variation while the second vector generally reflects patterns produced by radial versus ulnar count contrasts. Although vectors 1 and 2 appear to best explain population distributions, in some cases the third vector may contain a high enough significance to suggest relevent patterning. To be consistent, the third vector will also be included in each analysis to evaluate any patterning which might be present. The remaining vectors carry too little additional information to warrent evaluation.

Table 1. Male 20 Finger Ridge-Count Canonical Analysis Results.

# RTS EXTR	EIGEN	%TRACE	AFTER REMOVING ROOT			
			WILKS L	CHI SQR	DF	NOR DEV
0	---	---	0.58475	1932.163	900	19.749
1	0.1216	22.067	0.6558	1518.926	836	14.239
2	0.0689	12.498	0.7010	1279.095	774	11.247
3	0.0535	9.707	0.7385	1091.457	714	8.946
4	0.0442	8.025	0.7712	935.639	656	7.051
5	0.0386	7.014	0.8010	799.079	600	5.350
6	0.0368	6.685	0.8305	668.812	546	3.543
7	0.0286	5.195	0.8543	567.167	494	2.263
8	0.0255	4.619	0.8760	476.649	444	1.093

Table 2. Female 20 Finger Ridge-Count Canonical Analysis Results.

# RTS EXTR	EIGEN	%TRACE	AFTER REMOVING ROOT			
			WILKS L	CHI SQR	DF	NOR DEV
0	---	---	0.5940	1203.107	680	12.189
1	0.1038	19.410	0.6556	975.024	627	8.762
2	0.0781	14.603	0.7068	801.369	576	6.108
3	0.0583	10.902	0.7480	670.498	527	4.170
4	0.0520	9.726	0.7869	553.399	480	2.301
5	0.0438	8.192	0.8214	454.371	435	0.667

In the 35 female groups, four significant roots are generated by the canonical analysis. The first two vectors contain a similar overall percentage of the total structure information (33%) as the males, even with a lower number of significant roots. Vector 3 and 4 each contain about 10% of the remaining variation in the total canonical structure, suggesting that they may illustrate different aspects of group differentiation. However, this may only be an artifact of the fewer number of significant roots.

Significance Test of 10 Counts

The male and female canonical analysis results using the larger of the two ridge-counts are found in Tables 3 and 4. The 10 count canonical variation is contained in five significant vectors, incorporating 79% of the total variation between groups compared to the 71% contained in the 20 count male significant roots. The loss of this variation with the use of only 10 counts reduces the ability to discriminate groups by the variables, reducing the clarity of group separation. The first two roots identify the highest amount of this total differentiation (50%)with the third root containing a significant 12% of the information. Each of the remaining roots contain less than 10% of the remaining canonical structure.

Table 3. Male 10 Finger Ridge-Count Canonical Analysis Results.

# RTS EXTR	EIGEN	%TRACE	AFTER REMOVING ROOT WILKS L	CHI SQR	DF	NOR DEV
0	---	---	0.7282	1143.983	450	17.849
1	0.1086	33.286	0.8072	772.212	396	11.174
2	0.0567	17.376	0.8530	573.363	344	7.653
3	0.0394	12.082	0.8866	433.944	294	5.232
4	0.0273	8.370	0.9108	336.789	246	3.795
5	0.0262	8.014	0.9346	243.711	200	2.103
6	0.0196	6.012	0.9530	173.668	156	1.002

Table 4. Female 10 Finger Ridge-Count Canonical Analysis Results.

# RTS EXTR	EIGEN	%TRACE	AFTER REMOVING ROOT WILKS L	CHI SQR	DF	NOR DEV
0	---	---	0.7524	658.425	340	10.231
1	0.0899	30.846	0.8200	459.234	297	5.955
2	0.0482	16.528	0.8595	350.376	256	3.866
3	0.0388	13.322	0.8929	262.235	217	2.093
4	0.0322	11.033	0.9216	189.001	180	0.495

The female 10 count results have less significant roots than in the 10 count males. Only three significant roots separate 61% of the total canonical information. The first two roots contain 47% of the group variation while the last root represents the remaining 13% of the significant canonical structure. Although the third vector contains a substantial percentage of the information, it must be remembered there are fewer significant roots to distribute the information over in the female 10 count results. Therefore, the information in the vector may be significantly relevant in separating female groups, but have no relevance to biological reality.

In both the 10 count and 20 count results, the number of significant female roots is less than half that found in the male 10 roots. There appears to be a much greater amount of inter-group homogeneity within the females, restricting the level of separation and accuracy generated by using finger ridge-counts, particularly the 10 count data set.

Principal Coordinate Plots

20 count distributions

The male group distributions generated by 20 finger ridge-counts are presented in Figure 4 and 5, with the corresponding correlation coefficients given in Table 5. The first vector separates groups by an overall size aspect identified by high negative loadings on all the R+L coefficients. Only the fifth finger has strong loadings in the R-L coefficients.

Two major clusters are produced by this vector. The Pygmees and Bushmen are dispersed on the positive end of the vector while the remaining South and West African groups are more densely clustered at the negative end. There seems to be a marginally distinct clustering of three of the Madagascaran groups at the left end of the vector, this delineation being enhanced by the second vector. It appears that the separation of the Madagascaran groups is a product of the second vector alone since no discrimination of the Madagascarans is present in the plot of vector 1 versus vector 3 (Figure 5).

The Pygmees separate dermatoglyphically because of their propensity for low pattern size and ridge-count values. To generate this separation there must be a genetic component controlling these dermatoglyphic and

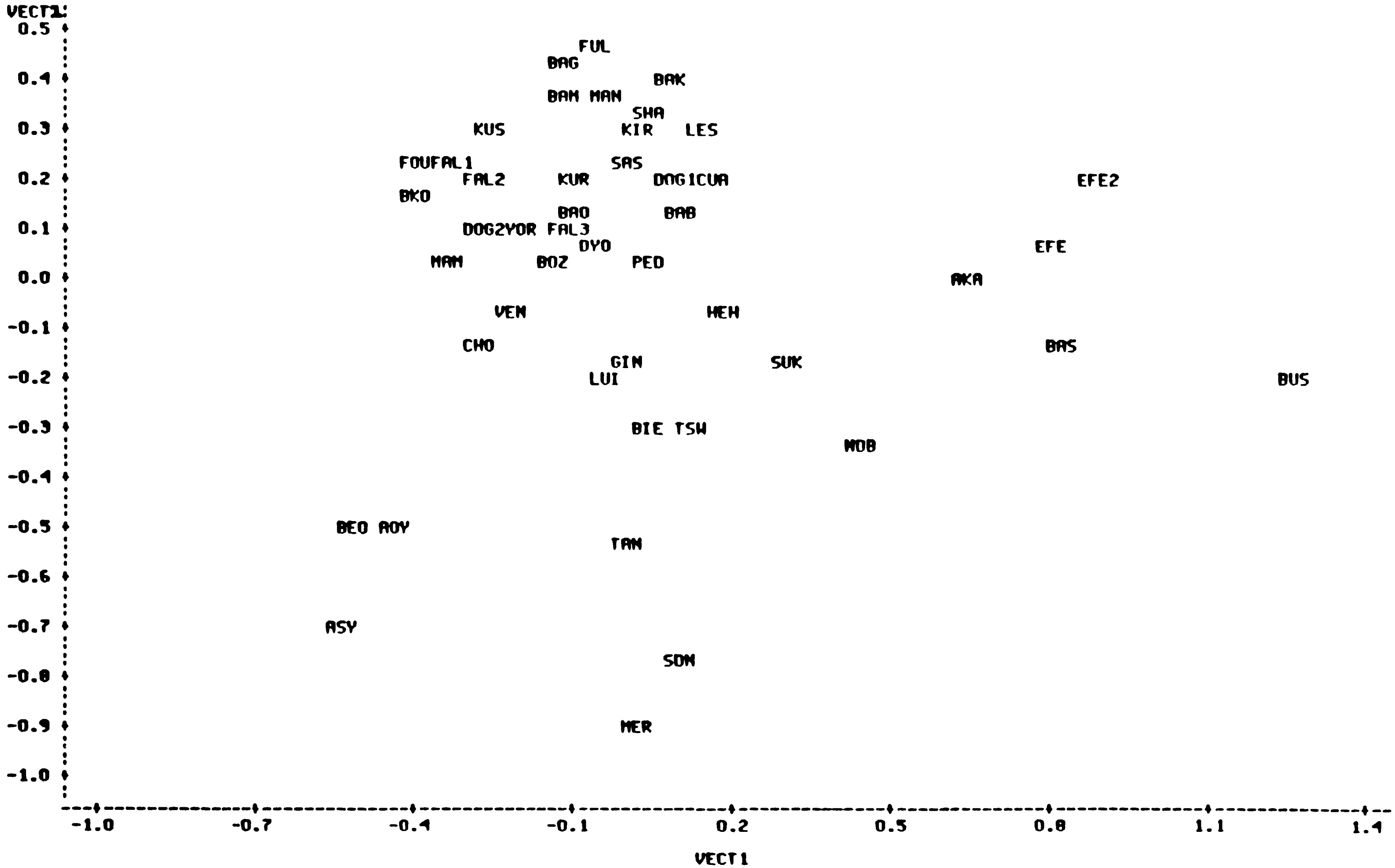


Figure 4. Male 20 Finger Ridge-Count Bivariate Plot of Vector 2 Versus Vector 1.

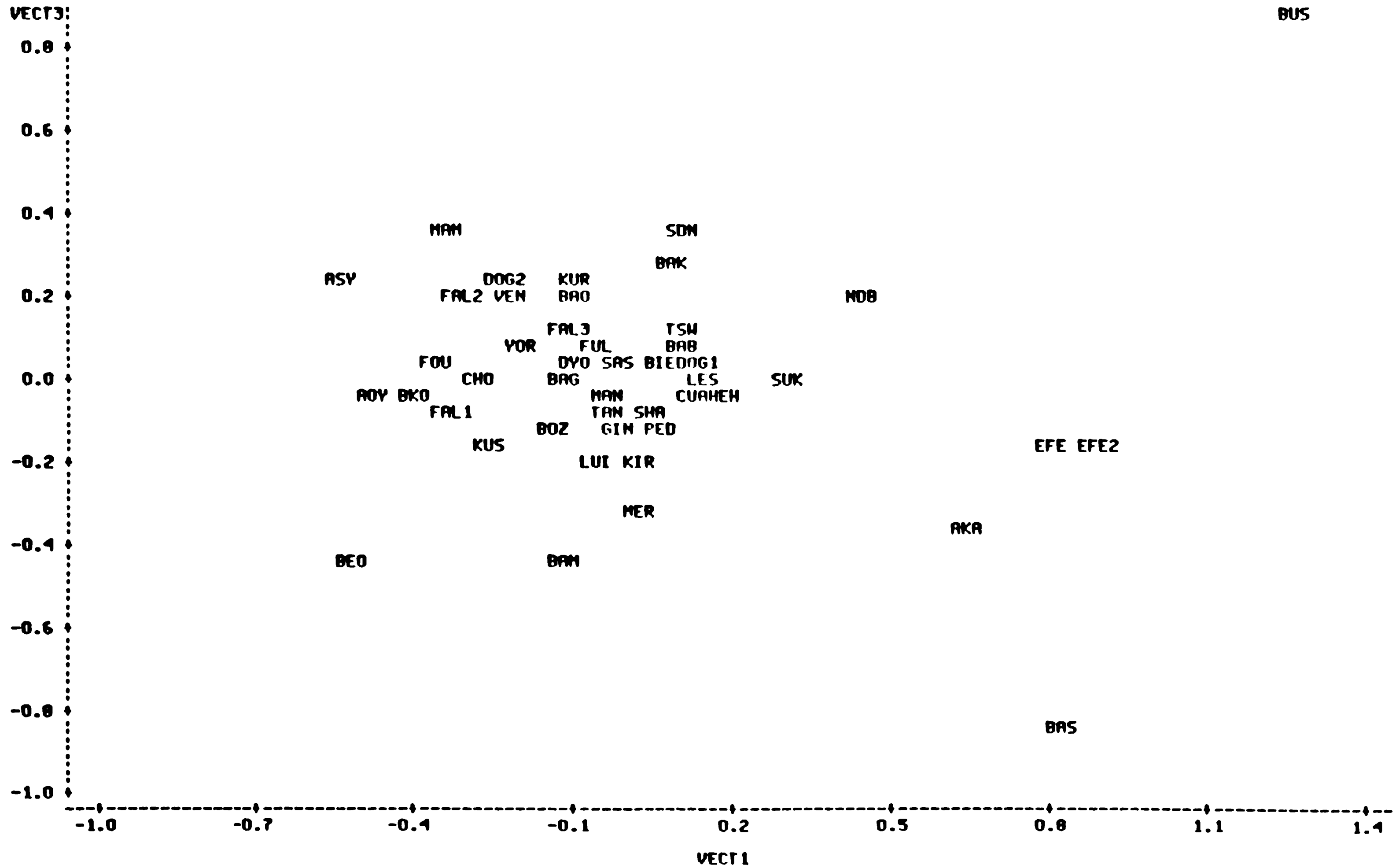


Figure 5. Male 20 Finger Ridge-Count Bivariate Plot of Vector 3 Versus Vector 1.

Table 5. Male 20 Finger Ridge-Count Pearson Correlation Coefficients and Probabilities.

		VECT1	VECT2	VECT3	VECT4
RADIAL+ULNAR	LI	-0.75854 0.0001	-0.35048 0.0169	0.10443 0.4898	0.36258 0.0133
	LII	-0.79073 0.0001	-0.16709 0.2670	0.21092 0.1594	0.15444 0.3055
	LIII	-0.78108 0.0001	-0.40689 0.0050	0.11285 0.4553	0.11676 0.4397
	LIV	-0.89780 0.0001	-0.22925 0.1254	0.11129 0.4615	-0.06380 0.6736
	LV	-0.95481 0.0001	-0.12427 0.4106	-0.12620 0.4033	-0.06336 0.6757
	RI	-0.72050 0.0001	-0.42726 0.0031	0.19976 0.1832	0.31111 0.0353
	RII	-0.78995 0.0001	-0.19328 0.1981	0.14819 0.3257	0.07790 0.6069
	RIII	-0.71861 0.0001	-0.48355 0.0007	0.14075 0.3508	0.11553 0.4445
	RIV	-0.79249 0.0001	-0.37407 0.0104	0.18719 0.2129	-0.19611 0.1915
	RV	-0.86673 0.0001	-0.30154 0.0417	-0.09614 0.5250	-0.09450 0.5322
RADIAL-ULNAR	LI	0.25615 0.0858	-0.64299 0.0001	-0.37836 0.0095	0.11771 0.4359
	LII	-0.26789 0.0719	-0.06477 0.6689	-0.19922 0.1844	-0.51171 0.0003
	LIII	-0.34856 0.0176	-0.46295 0.0012	-0.17318 0.2497	-0.37498 0.0102
	LIV	-0.29057 0.0501	-0.00604 0.9682	0.61222 0.0001	-0.12754 0.3983
	LV	-0.89703 0.0001	0.11555 0.4445	0.16186 0.2825	-0.09889 0.5132
	RI	0.35677 0.0149	-0.24566 0.0998	-0.65836 0.0001	0.37343 0.0106
	RII	0.06631 0.6615	0.24192 0.1053	-0.45009 0.0017	0.05100 0.5132
	RIII	-0.10925 0.4698	-0.47089 0.0010	-0.43292 0.0027	0.06437 0.6709
	RIV	0.03216 0.8320	0.05130 0.7349	0.42691 0.0031	0.27853 0.0609
	RV	-0.80693 0.0001	0.07934 0.6002	0.27807 0.0613	0.03934 0.7952

biological traits. The Bushmen follow an extreme separation from the large Negroid cluster and the Pygmees in all the principal coordinate plots. The Bushmen are from a different genetic genesis than the other groups in the study. The reason they associate more closely to the Pygmees is due to the relatively low ridge-count means which they share, not genetic affinity. Even with the remarkably high amounts of Khoisan admixture in South African Negroid populations, the Bushmen remain isolated from their biological and geographical neighbors.

The correlation coefficients of the second axis indicate the group centroids are segregated along this axis by the third finger on both hands in both the R+L and R-L values. Additional influences occur from RI and RIV in R+L values and LI in the R-L loadings. These thumb loadings are similar to results found by Jantz, et al. (1984). They indicate factoral loadings suggesting an independent development of the thumb from the remaining fingers. The variables used in this study are different than those used by Jantz, et al. (1984) so comparisons may not be equivalent. Even so, the results of this study do indicate a definite thumb control to the second vector.

A bimodal separation by the second vector isolates the Madagascaran groups from the continental African populations. In conjunction with the first vector, the groups tend to follow a geographical gradient placing the West Africans at the upper (positive) end of the vector, the Pygmees intermediate between the West and South, the South Africans slightly negative on the vector and the Madagascaran groups at the negative extreme.

The third vector only contains significant loadings in the R-L variables. Both hands appear to follow a decreasing I-IV gradient across the fingers, with RIV and LIV contrasting with the other factors. The biological implications and subsequent group distributions generated by this vector are not clear.

The 20 finger ridge-count variables pattern the groups into geographically distinct clusters. This separation follows a general west-south trend on the second axis. Within the larger geographic groupings, smaller sub-clusters of various groups can be seen. The South African groups from Pretoria, the Angolan and the Central-West Africans tend to form cohesive identities within their larger regional distributions.

The 20 count female finger ridge-count plots (Figures 6 and 7) separate group centroids into similar clusters seen in the male plots, but not with the same precision. Less distinct clusterings in these plots graphically illustrate the higher amount of dermatoglyphic homogeneity

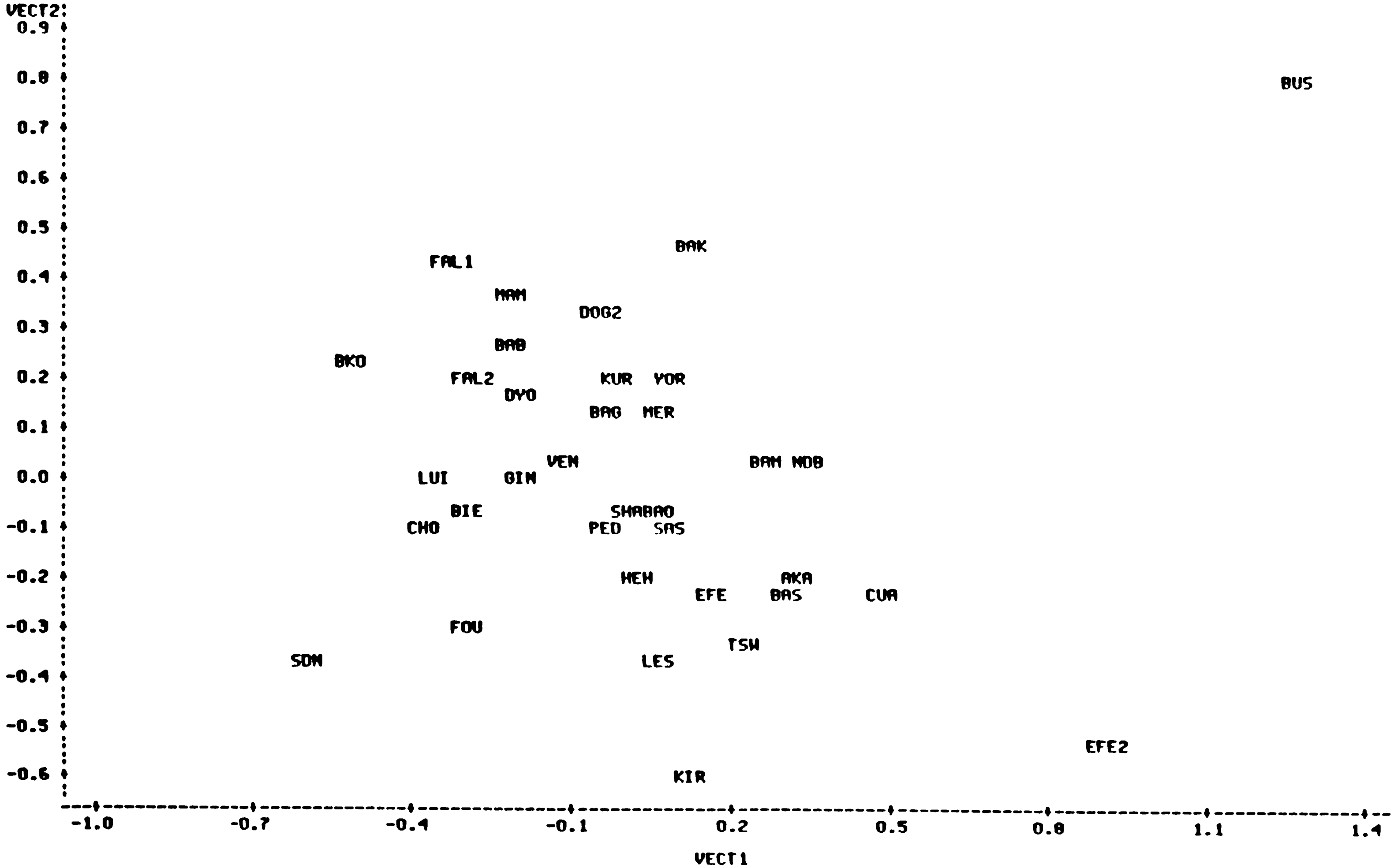


Figure 6. Female 20 Finger Ridge-Count Bivariate Plot of Vector 2 Versus Vector 1.

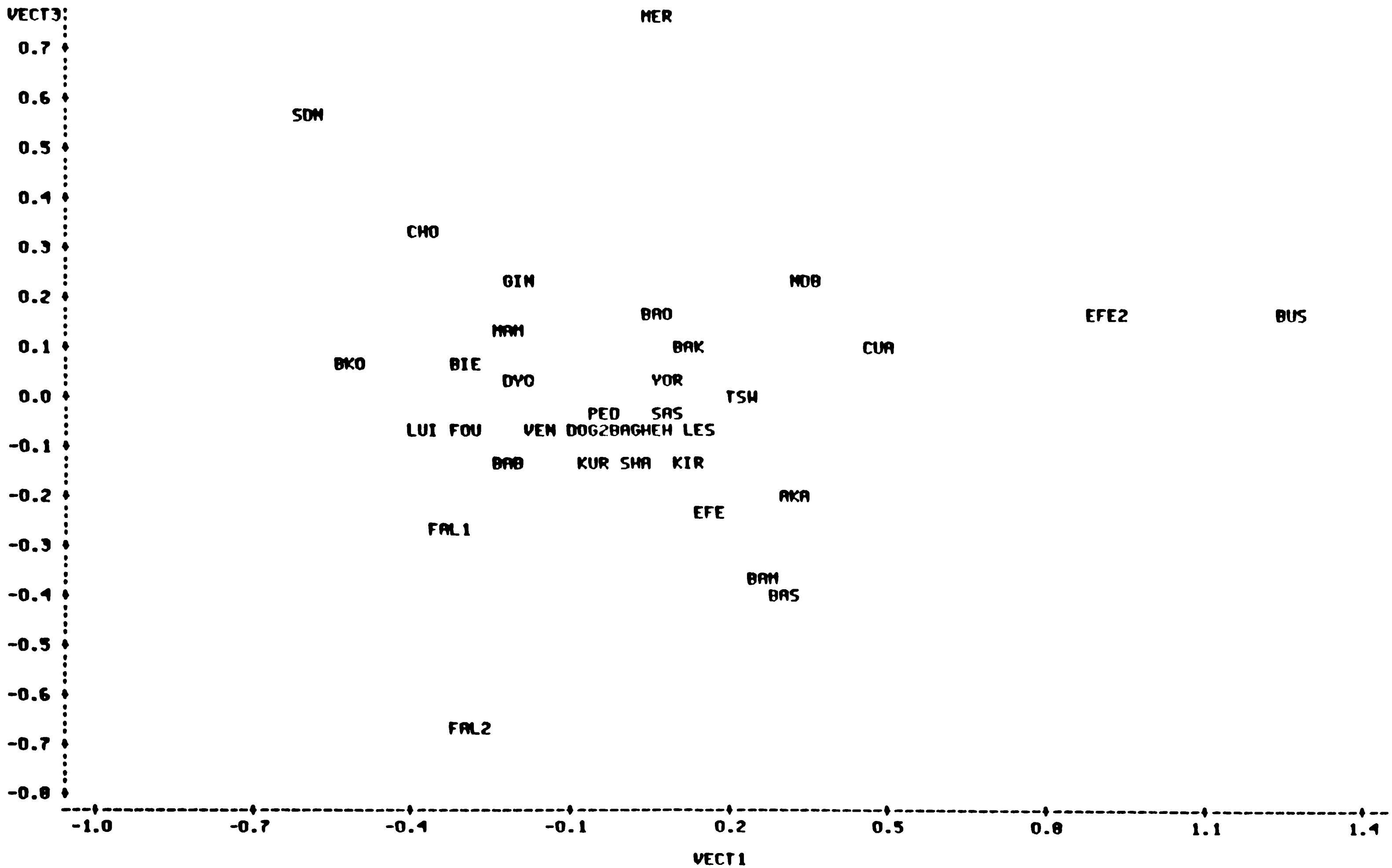


Figure 7. Female 20 Finger Ridge-Count Bivariate Plot of Vector 3 Versus Vector 1.

in African females suggested by the canonical analysis. The correlation coefficients of the first vector show a slightly weaker control of finger II in both hands in the males (Table 6). The right hand is not even significant. In the R-L variables, LV, and RIII-V have the strongest influence on the distributions. The right hand follows a decreasing cline from the fifth finger into the thumb.

The second vector is different from the males by the strongest loadings being on fingers II and IV in both hands and remaining significant loadings on the right hand except for RV. The R-L contrast are influenced by a inverse relationship of negatively loaded I and II in both hands against a positive LIV. Again, these loadings do not resemble what is found in the male vectors, and do not seem to follow any _a priori_ biological expectations. The group distributions are similar to those found in the male bivariate plots, but to a lesser degree. The West Africans are still at the positive end of the vector and the southern groups intermediate at the beginning of the negative end of the spectrum. But neither the Madagascaran nor the Pygmee groups separate to the degree found in the males.

The third vector follows even less understandable patterning of finger influences. All significant values are positively loaded. The R+L values show a relationship

Table 6. Female 20 Finger Ridge-Count Pearson Correlation Coefficients and Probabilities.

		VECT1	VECT2	VECT3	VECT4
RADIAL+ULNAR	LI	-0.81295 0.0001	0.34689 0.0412	0.35196 0.0381	0.03264 0.8523
	LII	-0.53232 0.0010	0.59679 0.0002	0.38745 0.0215	-0.30502 0.0748
	LIII	-0.59010 0.0002	0.36543 0.0309	0.62878 0.0001	-0.17444 0.3162
	LIV	-0.73212 0.0001	0.44065 0.0081	0.40037 0.0172	-0.15171 0.3843
	LV	-0.86572 0.0001	0.35733 0.0351	0.34626 0.0416	-0.28042 0.1028
	RI	-0.64929 0.0001	0.47555 0.0039	0.55973 0.0005	-0.00249 0.9887
	RII	-0.36052 0.0334	0.51275 0.0016	0.46150 0.0053	-0.40384 0.0161
	RIII	-0.55688 0.0005	0.44371 0.0076	0.62495 0.0001	-0.11009 0.5290
	RIV	-0.59443 0.0002	0.47060 0.0043	0.50737 0.0019	-0.20368 0.2406
	RV	-0.84635 0.0001	0.37126 0.0281	0.39893 0.0176	-0.11911 0.4955
RADIAL-ULNAR	LI	0.32265 0.0587	-0.53972 0.0008	0.54291 0.0008	0.21483 0.2152
	LII	-0.05056 0.7730	-0.63804 0.0001	0.43190 0.0096	-0.06970 0.6907
	LIII	-0.26003 0.1314	-0.21394 0.2172	0.59332 0.0002	0.23209 0.1797
	LIV	-0.27849 0.1052	0.53747 0.0009	0.44874 0.0069	-0.26652 0.1217
	LV	-0.77249 0.0001	0.34129 0.0448	0.25250 0.1434	-0.38884 0.0210
	RI	0.27627 0.1082	-0.74355 0.0001	0.12635 0.4695	0.33606 0.0484
	RII	-0.31201 0.0680	-0.79415 0.0001	-0.09310 0.5948	0.49467 0.0025
	RIII	-0.46725 0.0047	-0.49166 0.0027	0.29564 0.0847	0.42231 0.0115
	RIV	-0.53595 0.0009	0.22942 0.1849	-0.02353 0.8933	0.46753 0.0046
	RV	-0.83585 0.0001	0.22905 0.1857	0.20603 0.2351	-0.12942 0.4587

between LIII and all left hand loadings and in the R-L values, asymmetry being brought out between the RI-RIV and LI-LIV, but it is not clearly expressed in positive and negative terms.

10 count distributions

Both male and female bivariate plots (Figures 8-11) follow similar distribution patterns generated by the 20 ridge-count plots, but cluster delineation is not nearly as clear. The Pygmee groups are the best delineated cluster in the 10 count plots for both sexes, but there are close affiliations of the Angolan tribes and the South Africans within the larger cloud of groups. Part of the reason for the loss of clarity is due to the reduced group separation by Vector 2 in the 10 count results.

Vector 2 correlation coefficient signs are reversed from those in the 20 count plots, but this is not the cause for reduced group discrimination. Since the 10 count method only utilizes the larger of the two counts on each finger, the additional count from whorl patterns is ignored, and this aspect of intra-group variation is lost. The disregard for this additional information reduces the effective population separation presented in the plots and causes considerable reduction of the trace between the two ridge-count methods.

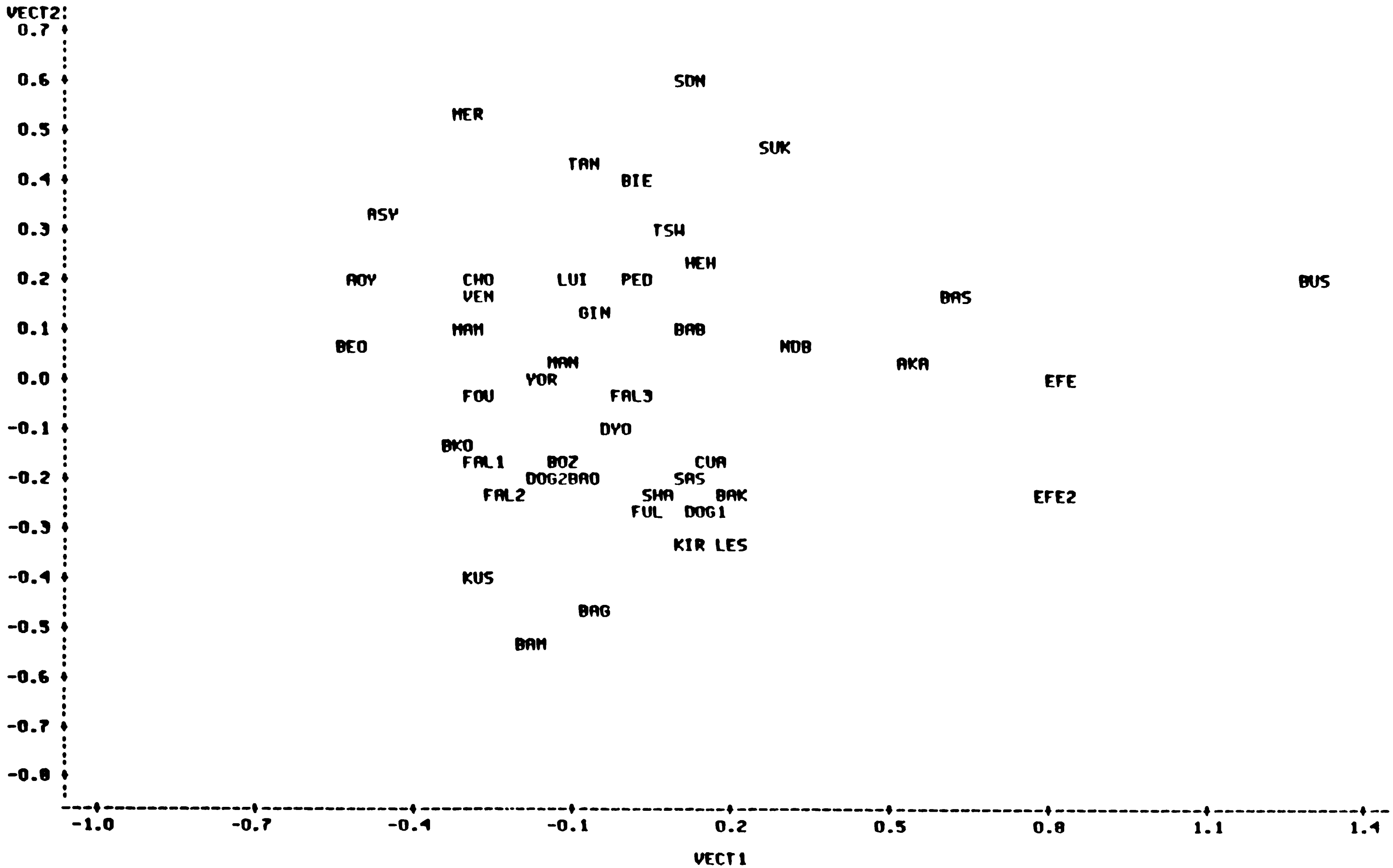


Figure 8. Male 10 Finger Ridge-Count Bivariate Plot of Vector 2 Versus Vector 1.

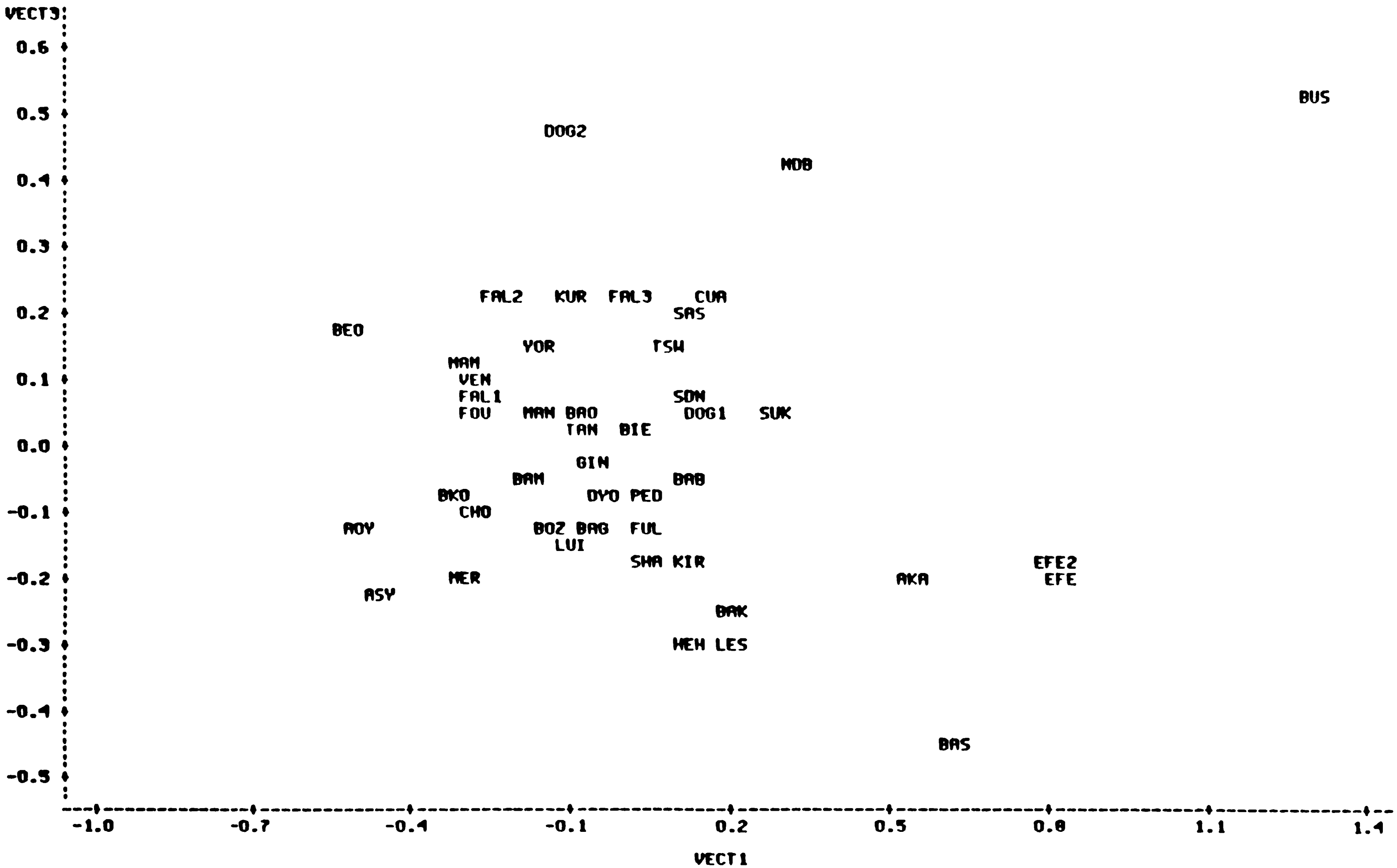


Figure 9. Male 10 Finger Ridge-Count Bivariate Plot of Vector 3 Versus Vector 1.

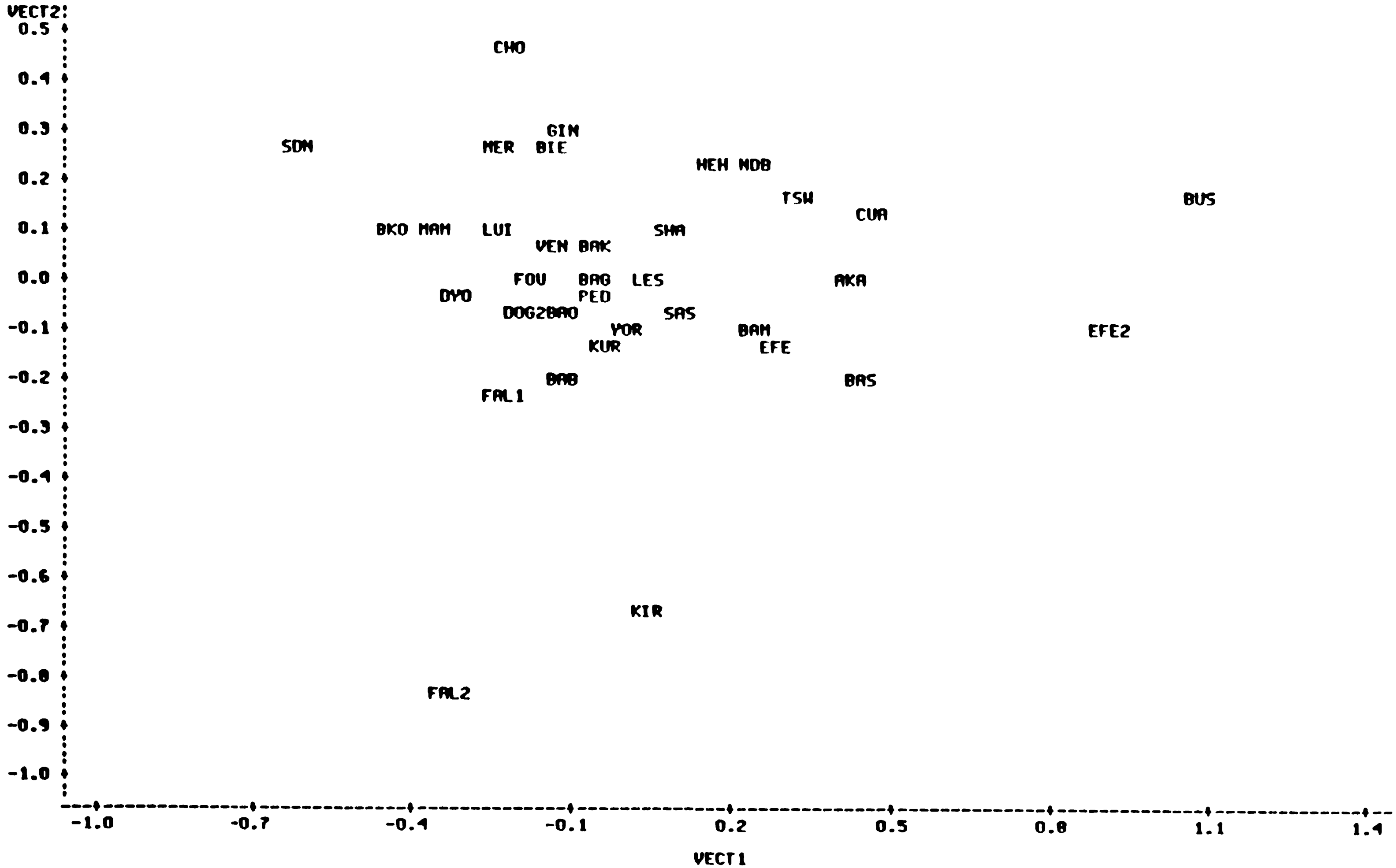


Figure 10. Female 10 Finger Ridge-Count Bivariate Plot of Vector 2 Versus Vector 1.

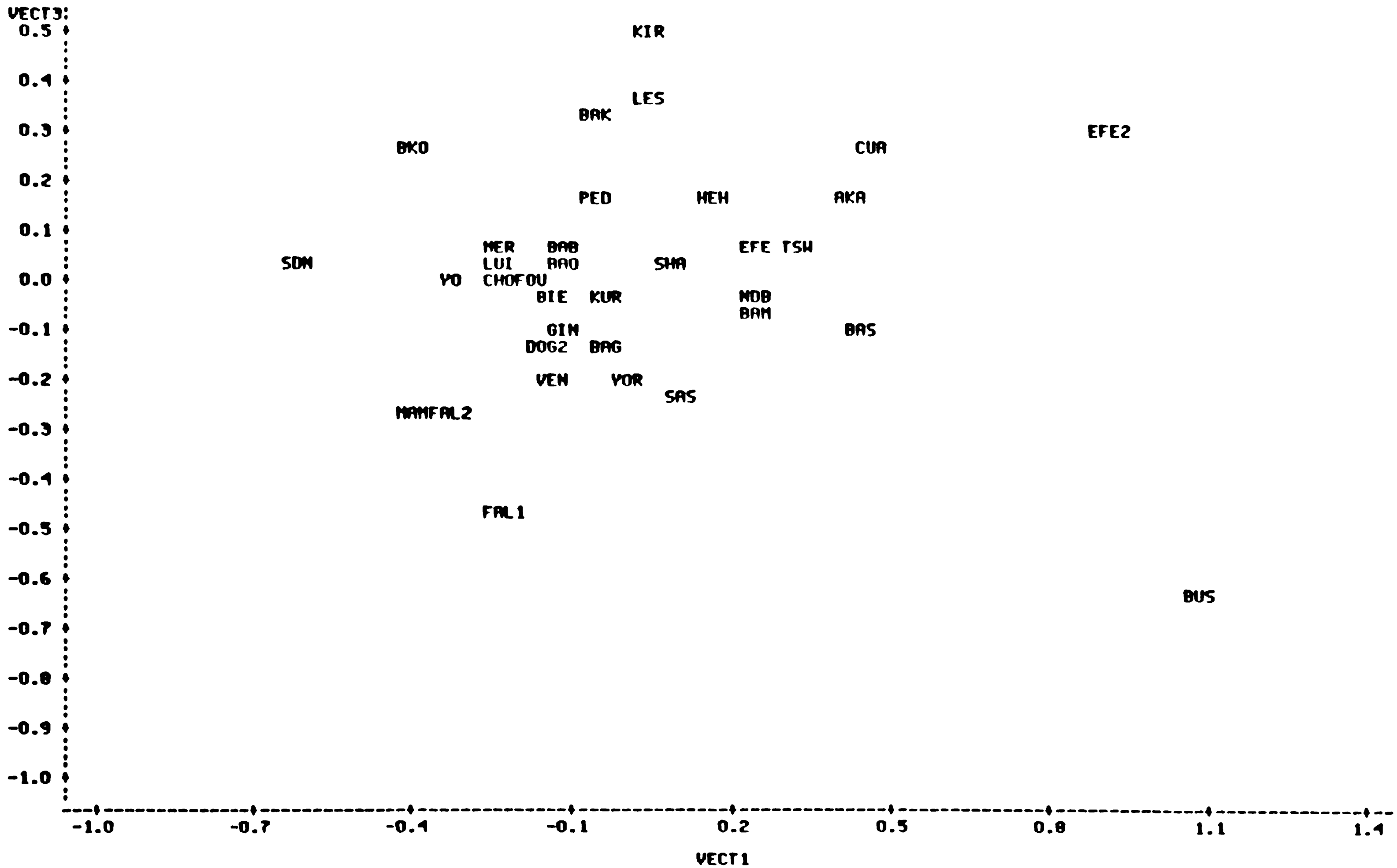


Figure 11. Female 10 Finger Ridge-Count Bivariate Plot of Vector 3 Versus Vector 1.

Table 7 shows this reduction in the trace between the 20 and 10 count results . The amount of inter-group variation among the populations has increased nearly two-fold between the two ridge-count methods, a factor which considerably influences the ability of the 10 count variables to effectively identify biological distance between groups.

As expected, the first vector for both sexes in the 10 count correlation coefficients indicates loadings influenced by overall ridge-count means (Tables 8 and 9). But there are some interesting interactions controlling the second vector in both sexes. In the males, the second vector is controlled by positive bimanual loadings on the thumb and third digit, similar to that found in the 20 count results. The female coefficients are also similar except the LI is no longer significant. This is slightly different from the female 20 count results since I and II were more influential in the 20 count second vector.

Table 7. Principal Correlation Trace Values for 10 and 20 Finger Ridge-Count Variables by Sex.

TRACE	Males	Females
20 counts	31.0483	21.7467
10 counts	17.4461	12.6498

Table 8. Male 10 Finger Ridge-Count Pearson Correlation Coefficients and Probabilities.

	VECT1	VECT2	VECT3	VECT4
LI	-0.77069 0.0001	0.50250 0.0004	-0.11478 0.4475	0.26315 0.0772
LII	-0.84114 0.0001	0.17150 0.2544	0.12456 0.4095	-0.09620 0.5248
LIII	-0.83562 0.0001	0.41475 0.0042	0.22947 0.1250	-0.15170 0.3142
LIV	-0.87951 0.0001	0.10449 0.4895	0.46368 0.0012	0.03219 0.8318
LV	-0.98863 0.0001	-0.05853 0.6992	0.17640 0.2409	0.02653 0.8611
RI	-0.70709 0.0001	0.55290 0.0001	-0.08140 0.5907	0.28911 0.0513
RII	-0.84433 0.0001	0.21384 0.1536	0.15530 0.3027	0.03738 0.8052
RIII	-0.76351 0.0001	0.52521 0.0002	0.11880 0.4316	-0.16188 0.2824
RIV	-0.77287 0.0001	0.32295 0.0286	0.54780 0.0001	-0.00105 0.9945
RV	-0.92425 0.0001	0.09804 0.5169	0.19079 0.2040	0.22128 0.1394

Table 9. Female 10 Finger Ridge-Count Pearson Correlation Coefficients and Probabilities.

	VECT1	VECT2	VECT3	VECT4
LI	-0.83227 0.0001	0.34933 0.0397	0.02437 0.8895	0.20824 0.2300
LII	-0.79559 0.0001	0.06559 0.7081	-0.25284 0.1428	0.42999 0.0099
LIII	-0.69477 0.0001	0.50038 0.0022	-0.11904 0.4958	0.57235 0.0003
LIV	-0.80895 0.0001	0.30182 0.0781	-0.40201 0.0167	0.29849 0.0816
LV	-0.97924 0.0001	0.07390 0.6731	-0.07570 0.6656	0.16313 0.3491
RI	-0.68126 0.0001	0.59651 0.0002	0.04925 0.7787	0.12492 0.4746
RII	-0.61989 0.0001	0.28603 0.0958	-0.32544 0.0564	0.41808 0.0124
RIII	-0.70796 0.0001	0.59480 0.0002	-0.09749 0.5774	0.41226 0.0139
RIV	-0.76032 0.0001	0.28178 0.1010	-0.55113 0.0006	0.24967 0.1480
RV	-0.95510 0.0001	0.20737 0.2320	-0.15648 0.3693	-0.03820 0.8275

Only the fourth digit has significant loadings bimanually in the male's third vector. The females have the same IV loadings, but on a slightly weaker level. The total amount of canonical structure is relatively low for the third vector in both sexes. In conjunction with the single finger controls found in the correlation coefficients, the biological reality represented by this vector graphically is suspect.

Palm Ridge-Count Results

Significance Test

The palmar ridge-count canonical analysis results are given in Tables 10 and 11. The males only have three significant vectors, and the females, only two. The first two vectors in the males contain 62% of the total canonical structure. The last significant vector contains an additional 13% of the remaining information. The two significant female canonical vectors identify 66% of the total canonical structure, slightly more than the male's first two vectors. But the overall significant analysis of the female interdigital counts is lacking the 13% contained in the male's third vector, a rather substantial amount for one root.

Table 10. Male Palmar Interdigital Ridge-Count Canonical Analysis Results.

# RTS EXTR	EIGEN	%TRACE	AFTER REMOVING ROOT			
			WILKS L	CHI SQR	DF	NOR DEV
0	---	---	0.8065	608.134	252	12.447
1	0.0808	36.622	0.8717	388.388	205	7.647
2	0.0576	26.097	0.9218	230.068	160	3.590
3	0.0288	13.073	0.9484	149.649	117	2.036
4	0.0223	10.091	0.9696	87.375	76	0.931

Table 11. Female Palmar Interdigital Ridge-Count Canonical Analysis Results.

# RTS EXTR	EIGEN	%TRACE	AFTER REMOVING ROOT			
			WILKS L	CHI SQR	DF	NOR DEV
0	---	---	0.7889	475.834	186	11.588
1	0.0941	38.482	0.8631	295.407	150	7.015
2	0.0689	28.171	0.9226	161.756	116	2.788
3	0.0300	12.281	0.9503	102.393	84	1.387
4	0.0226	9.263	0.9718	57.455	54	0.376

Just as was observed between the 20 and 10 finger ridge-count test of significance, the number of variables in an analytical test has an effect on the number and importance of significant roots. The number of variables dimension the space used to describe the population variation. In the case of interdigital ridge-counts, there are fewer significant roots in the total canonical structure since there are only six variables, and each root carries a greater amount of individual information. Significance of the root does not indicate the reliability of that root to identify understandable reality, they do follow a statistically significant pattern of discrimination.

Principal Coordinate Plots

Similarly to the finger ridge-counts, the interdigital ridge-count correlation coefficients for the first vector are controlled by overall ridge-count means in both sexes (Tables 12 and 13). A slight A-B to C-D gradient appears to be present in the male coefficients but not in the females. The inversion of the sign between the two sexes is not important. The distribution of the male groups by the first vector congregate the various related groups into clusters vaguely familiar to the

Table 12. Male Palmar Interdigital Ridge-Count Pearson Correlation Coefficients and Probabilities.

	VECT1	VECT2	VECT3	VECT4
LC-D	-0.62640	0.61367	-0.30890	-0.09878
	0.0001	0.0001	0.0438	0.5286
LB-C	-0.62266	0.73341	0.33936	-0.00781
	0.0001	0.0001	0.0260	0.9604
LA-B	-0.93818	-0.10770	-0.08805	-0.06911
	0.0001	0.4918	0.5745	0.6597
RA-B	-0.96153	-0.20015	-0.09657	-0.06199
	0.0001	0.1981	0.5379	0.6929
RB-C	-0.64413	0.68251	0.15494	-0.36654
	0.0001	0.0001	0.3212	0.0156
RC-D	-0.66540	0.40332	-0.59879	0.26206
	0.0001	0.0073	0.0001	0.0896

Table 13. Female Palmar Interdigital Ridge-Count Pearson Correlation Coefficients and Probabilities.

	VECT1	VECT2	VECT3	VECT4
LC-D	0.66930	0.16935	0.24918	-0.53585
	0.0001	0.3541	0.1690	0.0016
LB-C	0.77947	0.28915	-0.49033	-0.27648
	0.0001	0.1085	0.0044	0.1256
LA-B	0.73409	-0.67257	0.41403	-0.37411
	0.0001	0.0001	0.0185	0.0349
RA-B	0.76736	-0.67482	0.29454	-0.45053
	0.0001	0.0001	0.1018	0.0097
RB-C	0.66433	0.59567	-0.16725	-0.35915
	0.0001	0.0003	0.3602	0.0435
RC-D	0.85904	-0.28387	0.26801	-0.13512
	0.0001	0.1154	0.1381	0.4609

relationships generated by the finger ridge-counts (Figures 12 and 13). Individual placement of different groups decreases any distinct geographical clustering making identification of population structuring by palm ridge-counts less accurate than finger ridge-count variables. The Bushmen no longer are distinctly separated. Instead, the Efe are now outlying from the remaining groups. The Pygmee groups still indicate differentiation from the Southern Africans. The Southern groups all fall in the negative portion of Vector 1 while the Pygmees are around 0.2. No Western or Madagascaran discrimination is present.

The female first vector forms even less population differentiation than the males (Figures 14 and 15). The Bushmen sample follows the finger ridge-count results, separating out to one extreme of the vector. But other than this one pattern, population clusters are not clearly discernible due to wide dispersion of related groups from one another.

The male second vector separates groups by C-D and B-C counts in both hands (Table 12) while the female second vector is controlled by high negatively weighted A-B counts, with a contrasting interplay of the right A-B and a positively weighted B-C coefficient. The significance of the various interdigital influences is not clear for

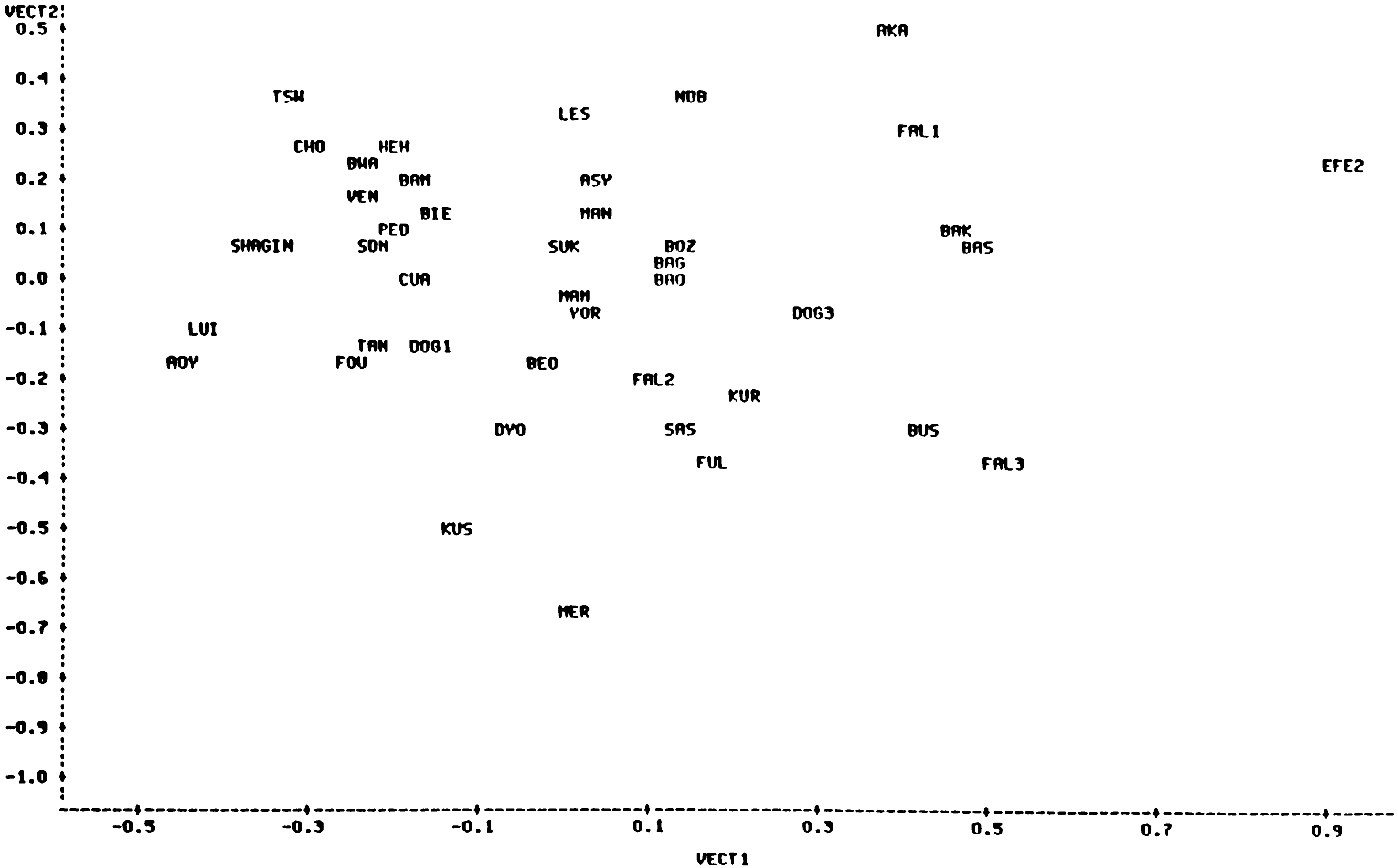


Figure 12. Male Palmar Interdigital Ridge-Count Bivariate Plot of Vector 2 Versus Vector 1.

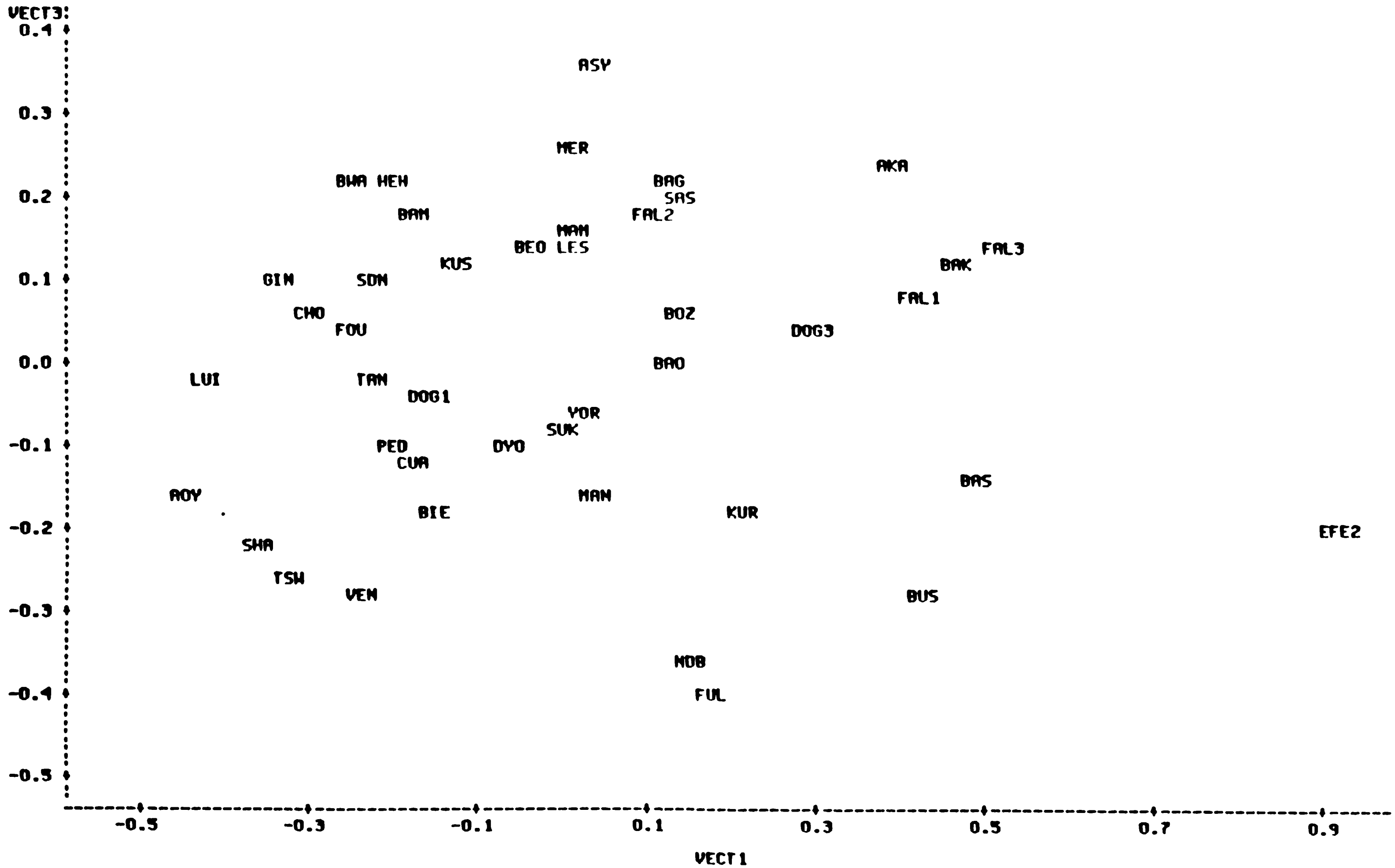


Figure 13. Male Palmar Interdigital Ridge-Count Bivariate Plot of Vector 3 Versus Vector 1.

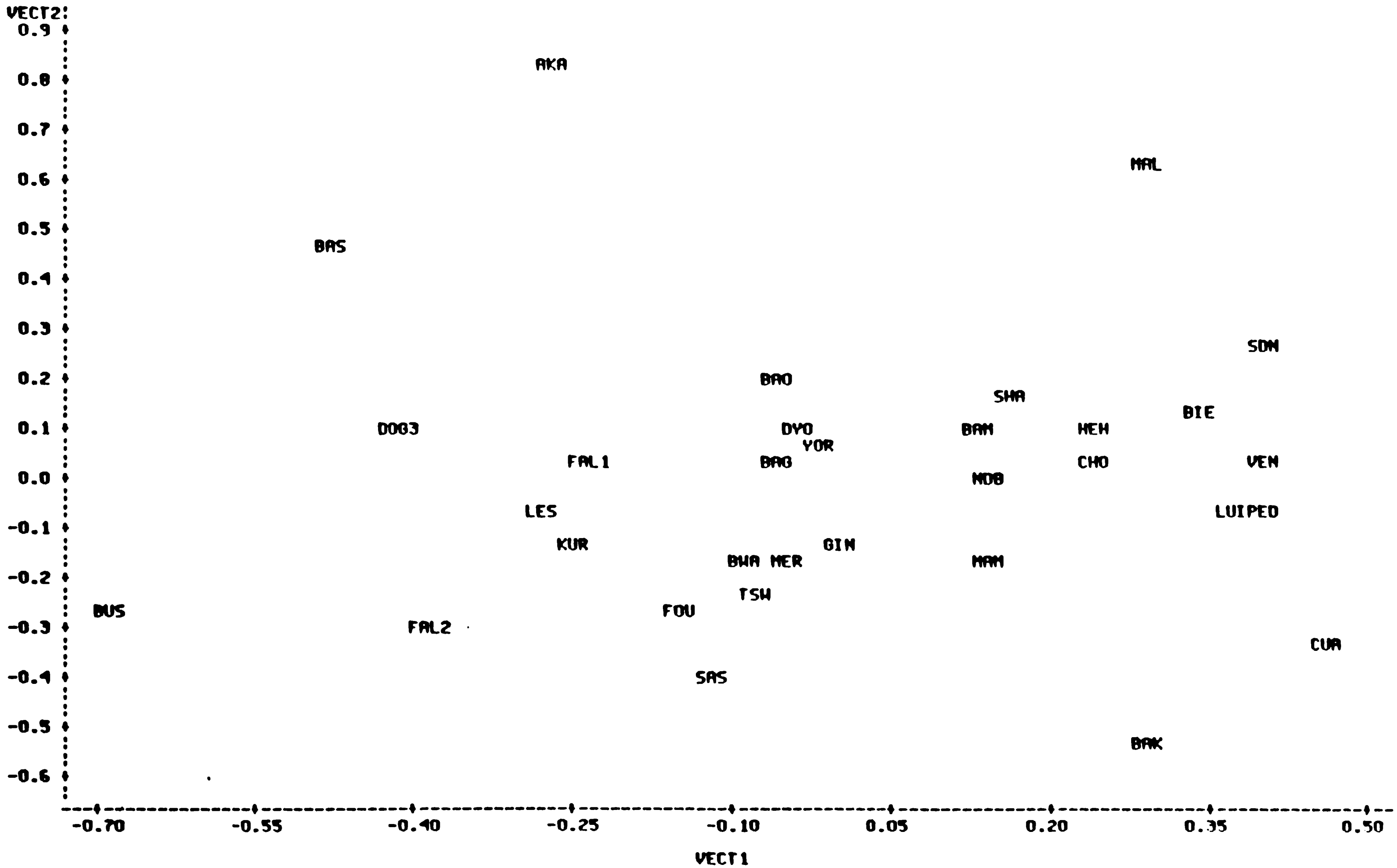


Figure 14. Female Palmar Interdigital Ridge-Count Bivariate Plot of Vector 2 Versus Vector 1.

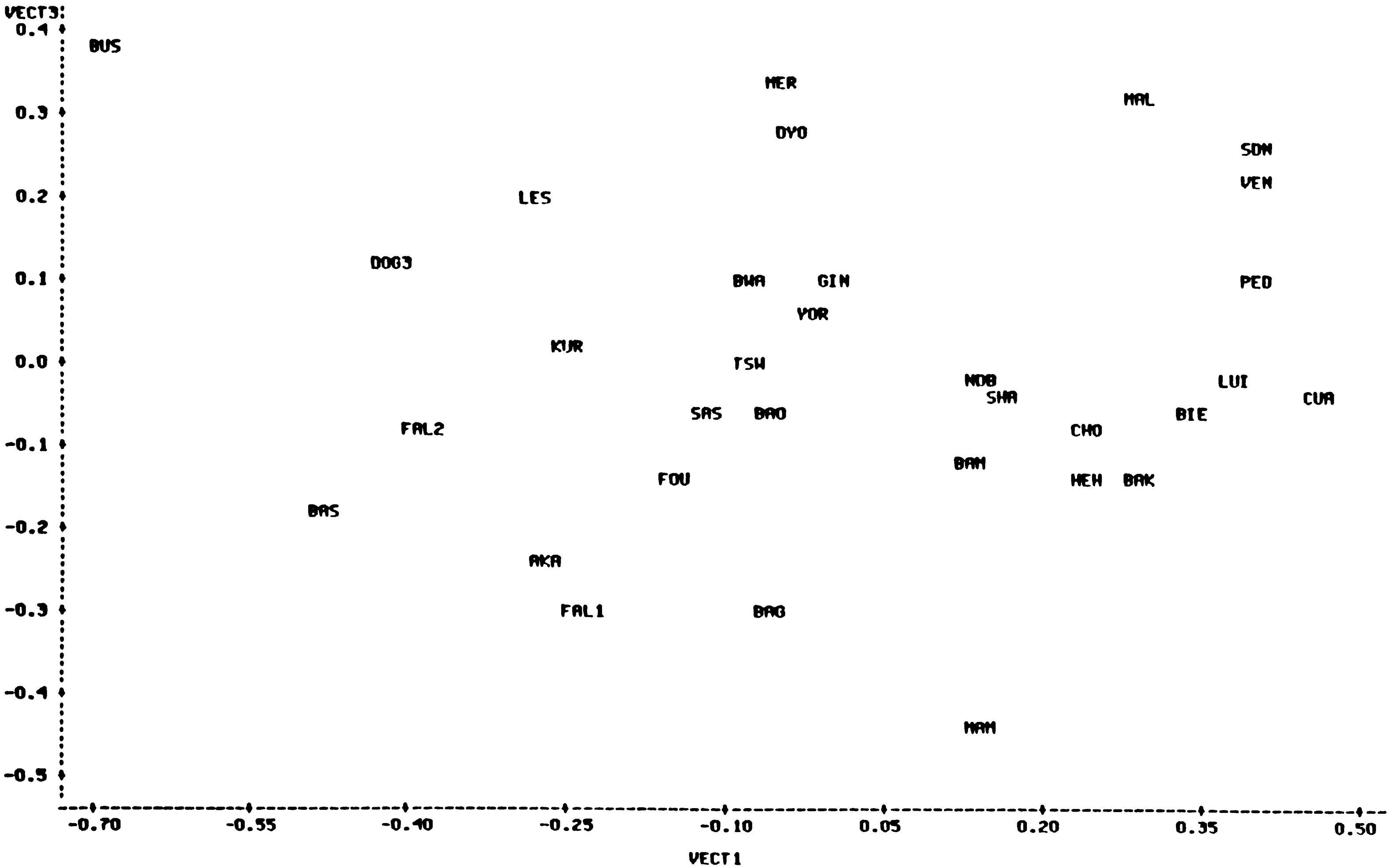


Figure 15. Female Palmar Interdigital Ridge-Count Bivariate Plot of Vector 3 Versus Vector 1.

either of the sexes, and the group distributions by this vector do not conform to any expected pattern.

The coefficient pattern in the male third and last significant root is interesting. Where there had been positive B-C and C-D loading in Vector 2, there is a C-D, B-C contrast in the third vector. Again, the group distributions by this vector do not follow any expected biological or geographical patterns, but the contrast between the variables is interesting. Jantz and Hawkinson (1979) found bimanual contrasts between finger ridge-counts in their series of African samples. A similar form of dermal contrast may be present in the palmar variables, even though they do not delineate geographic separation, as are produced by the finger contrasts.

It is somewhat disconcerting that the palmar interdigital ridge-counts do not produce geographic or biological relationships similar to those found in the finger ridge-count results. But these new relationships are produced by genetic and environmental factors slightly different from the fingers and thus should not be exactly the same. Genetic controls and environmental influences on palmar dermatoglyphics have not been as intensely investigated as in the fingers. Thus explanation of these processes are left to speculation. Since palmar ridge patterns begin to form slightly later than the fingers, there would be different environmental factors at work on the palms as well as different genetic variables coding for the genesis of this system. These new aspects are reflected in the population structuring differences present between the palm and the finger results.

Finger Pattern Results

Because finger patterns are qualitative rather than quantitative as in ridge-counts, only mean frequency data are produced. Intuitively, the finger pattern frequencies should produce similar results as those found in the 20 finger ridge-count method since whorls are quantified by the second count. Even with this expectation, some variation should be present as a result of the coarser analytical nature of qualitative traits. The extent of this variation between qualitative and quantitative dermatoglyphic variables is one aspect to be evaluated in this study.

The vector distributions produced by the finger pattern frequencies (Figures 16-19) generally follow the same patterns illustrated in the 20 and the 10 finger ridge-count results. In the males, the first vector seems to be slightly more similar to the group delineations formed by the 20 count first vector. The second vector

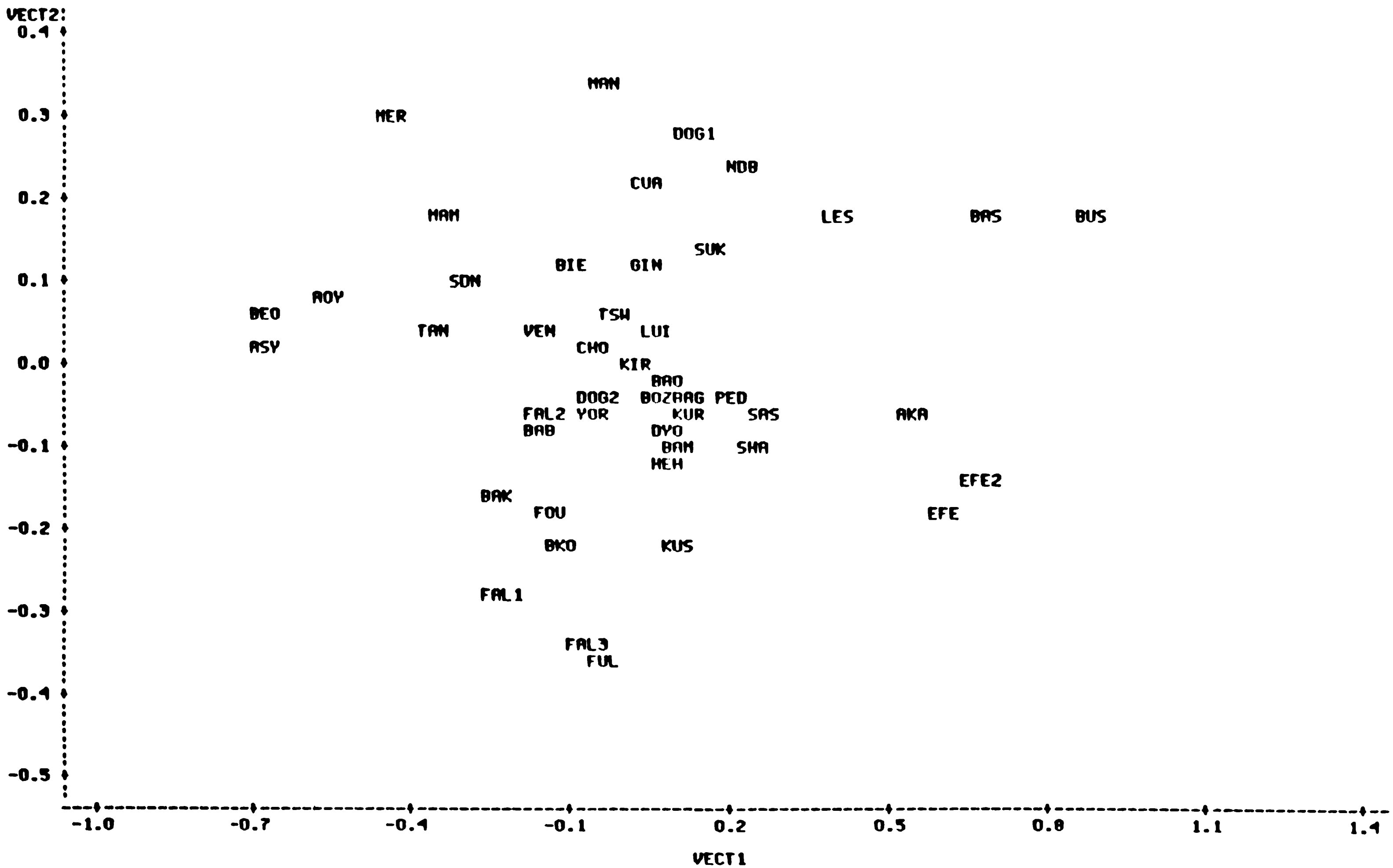


Figure 16. Male Finger Pattern Frequency Bivariate Plot of Vector 2 Versus Vector 1.

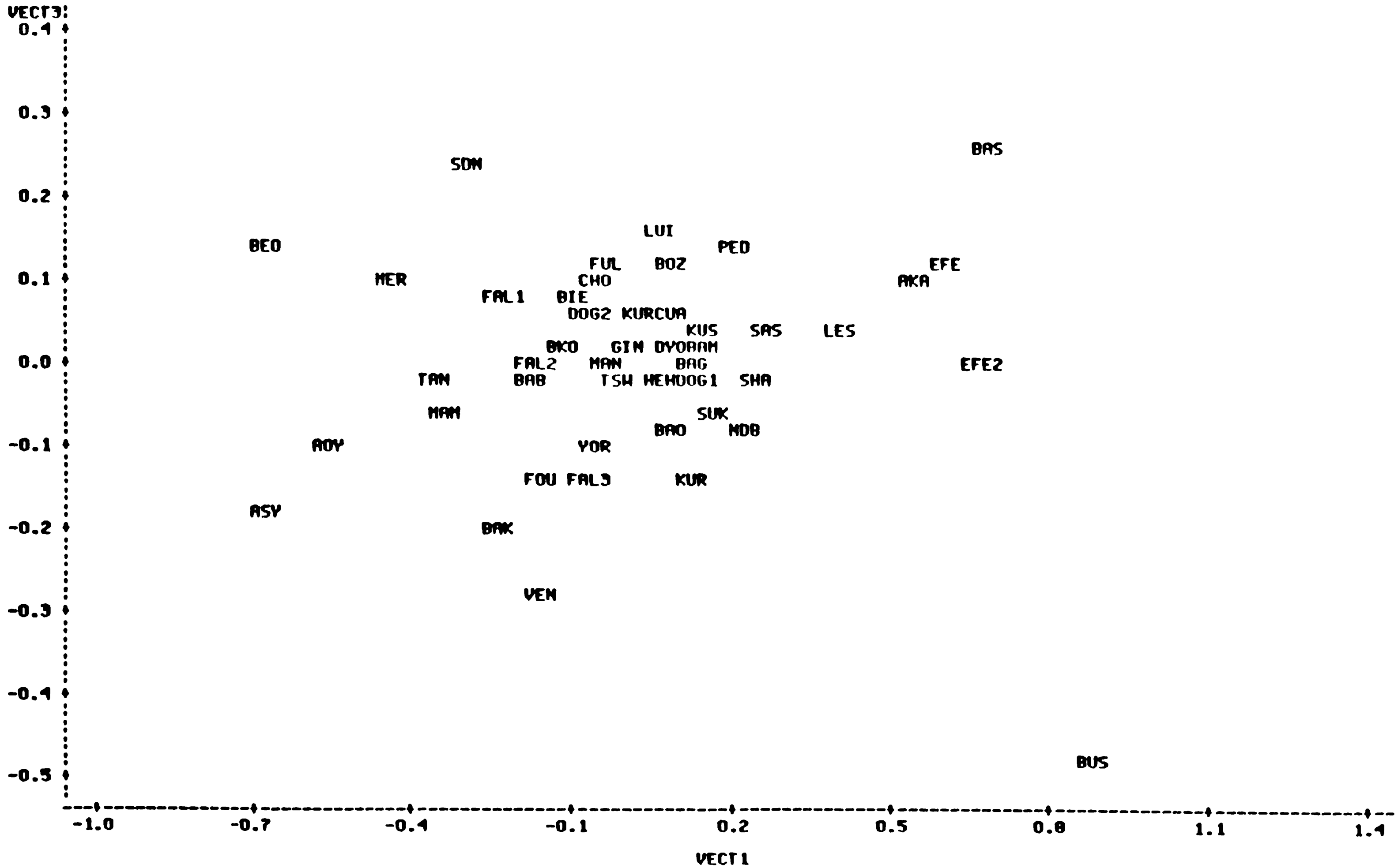


Figure 17. Male Finger Pattern Frequency Bivariate Plot of Vector 3 Versus Vector 1.

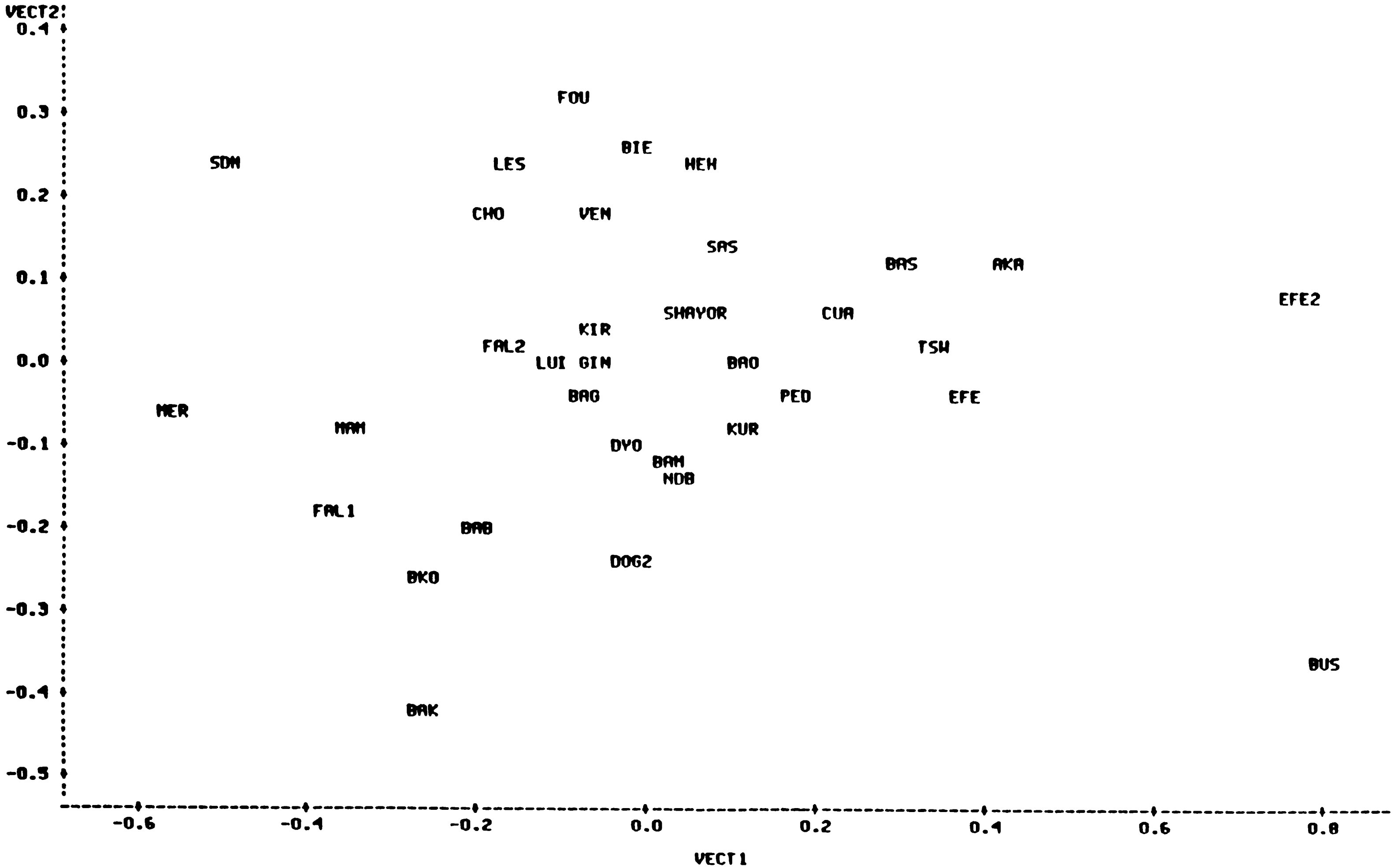


Figure 18. Female Finger Pattern Frequency Bivariate Plot of Vector 2 Versus Vector 1.

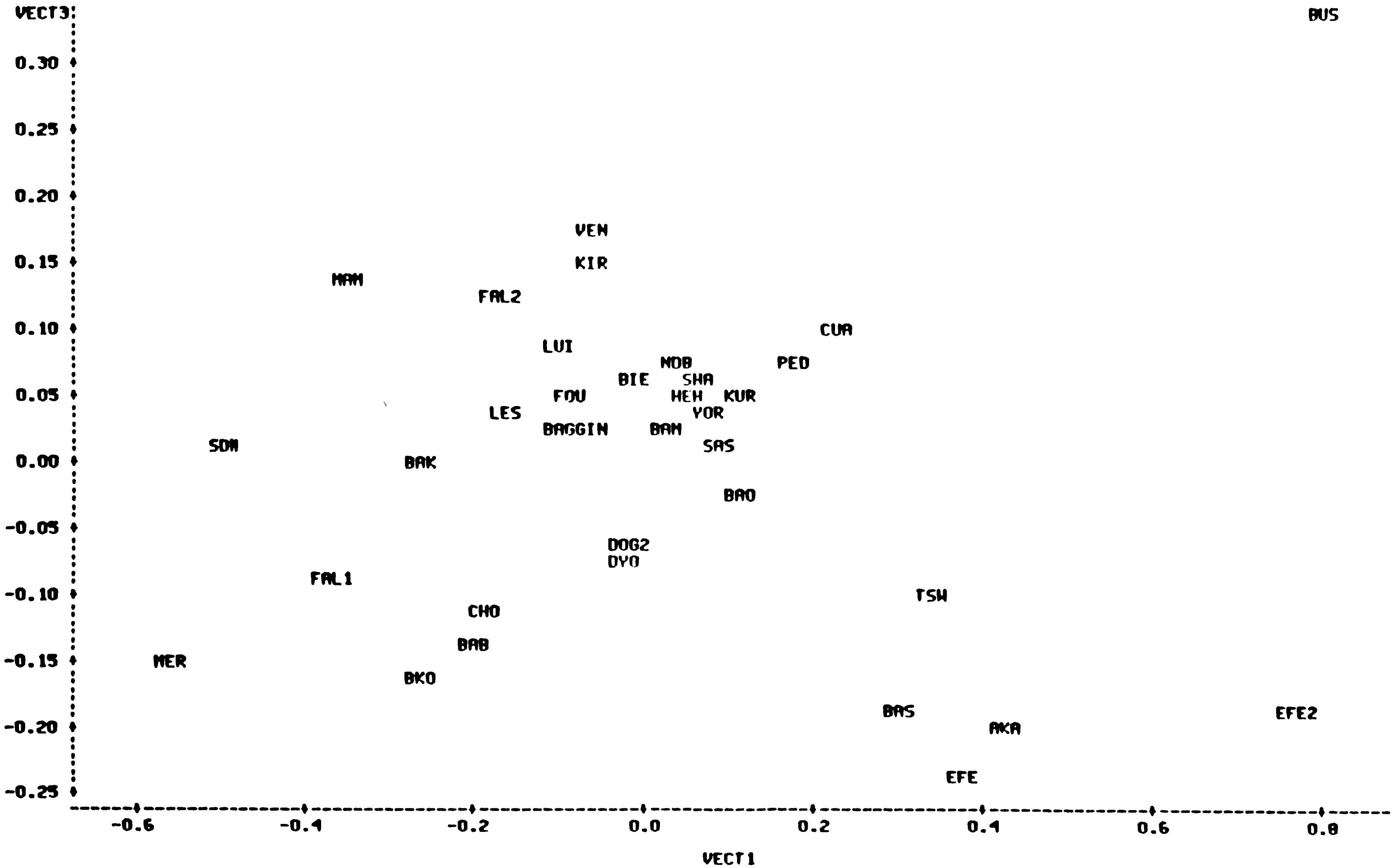


Figure 19. Female Finger Pattern Frequency Bivariate Plot of Vector 3 Versus Vector 1.

tends to disperse the groups more openly in the pattern plot. The female's finger pattern plots do not appear to reflect distributions comparable to either the 20 or the 10 finger ridge-count plots. The Bushmen and Pygmee groups do follow some similar delineation as was found in the ridge-count results, but there is no separation of the South, West or Madagascaran populations into identifiable relationships.

The coefficients of the vectors in the males (Table 14) indicate the group distributions are regulated by arch -whorl contrasts on all fingers in both hands. Along with this overall control, there is some added significant weighting on the ulnar counts, particularly in fingers III, IV and V.

The arches on LIII and LIV are contrasted against ulnar values on the other fingers in the second male vector. The loading is similarly borne out to a lesser extent in the right hand, with RIV and RIII arches negatively weighted against a positive RIII. The third vector shows positive loadings for ulnar patterns on fingers II and III. Since significance tests through canonical analysis could not be done on finger pattern frequencies, it is not known whether this vector contains pertinent information. Judging from the similar pattern of the third vector loadings to the second vector and the

Table 14. Male Finger Pattern Pearson Correlation Coefficients and Probabilities.

	VECT1	VECT2	VECT3	VECT4
LIA	0.65850 0.0001	-0.19018 0.2055	-0.20986 0.1616	0.32088 0.0297
LIR	0.24703 0.0979	-0.07401 0.6250	0.14105 0.3498	0.17307 0.2501
LIU	0.68069 0.0001	0.41919 0.0037	0.20643 0.1687	0.00089 0.9953
LIW	-0.83696 0.0001	-0.22359 0.1353	-0.07233 0.6329	-0.16239 0.2809
LIIA	0.82061 0.0001	-0.13896 0.3570	-0.04923 0.7453	-0.06742 0.6562
LIIR	0.25110 0.0923	0.48199 0.0007	-0.20668 0.1682	-0.13928 0.3559
LIIU	0.21264 0.1560	0.18869 0.2092	0.58338 0.0001	0.09735 0.5198
LIIW	-0.78752 0.0001	-0.32850 0.0258	-0.33997 0.0208	0.03682 0.8081
LIIIA	0.80511 0.0001	-0.41890 0.0038	-0.21425 0.1528	0.04919 0.7455
LIIIR	-0.11071 0.4639	0.01290 0.9322	-0.35834 0.0145	-0.51452 0.0003
LIIIU	0.28261 0.0570	0.62706 0.0001	0.50813 0.0003	-0.01639 0.9139
LIIIW	-0.76614 0.0001	-0.32124 0.0295	-0.29979 0.0430	0.04024 0.7906
LIVA	0.75760 0.0001	-0.38671 0.0079	0.13163 0.3832	-0.29735 0.0448
LIVR	0.38564 0.0081	0.00013 0.9993	0.16865 0.2626	0.05934 0.6952
LIVU	0.68495 0.0001	0.46564 0.0011	-0.26645 0.0735	-0.06553 0.6652
LIVW	-0.86125 0.0001	-0.28015 0.0593	0.16981 0.2592	0.13916 0.3563
LVA	0.75047 0.0001	-0.06940 0.6467	-0.28140 0.0582	-0.37951 0.0093
LVR	0.20297 0.1761	0.03662 0.8091	0.07292 0.6301	-0.02278 0.8805
LVU	0.22725 0.1288	0.30812 0.0372	-0.21178 0.1577	0.49482 0.0005
LVW	-0.62257 0.0001	-0.25395 0.0886	0.33546 0.0227	-0.26237 0.0782

Table 14. Continued.

	VECT1	VECT2	VECT3	VECT4
RIA	0.60647	0.07195	-0.17476	0.33963
	0.0001	0.6347	0.2454	0.0209
RIR	0.09611	0.07371	-0.24059	0.41133
	0.5252	0.6264	0.1073	0.0045
RIU	0.67359	0.11356	0.26623	0.03866
	0.0001	0.4524	0.0737	0.7987
RIW	-0.81621	-0.13075	-0.13769	-0.19930
	0.0001	0.3864	0.3615	0.1842
RIIA	0.79368	-0.22589	0.06374	-0.14631
	0.0001	0.1312	0.6739	0.3319
RIIR	-0.04107	0.30940	-0.57748	-0.52267
	0.7864	0.0364	0.0001	0.0002
RIIU	0.40549	0.20192	0.55071	0.25917
	0.0052	0.1784	0.0001	0.0820
RIIW	-0.74809	-0.26508	-0.20881	0.13688
	0.0001	0.0750	0.1637	0.3643
RIIIA	0.68909	-0.50675	0.07130	-0.00400
	0.0001	0.0003	0.6377	0.9789
RIIIR	-0.46167	-0.14901	-0.41086	0.06279
	0.0012	0.3230	0.0046	0.6785
RIIIU	0.46068	0.51917	0.36666	-0.13463
	0.0013	0.0002	0.0122	0.3724
RIIIW	-0.80115	-0.15839	-0.33474	0.12295
	0.0001	0.2931	0.0230	0.4156
RIVA	0.56141	-0.62506	-0.00065	-0.21044
	0.0001	0.0001	0.9966	0.1604
RIVR	0.41147	-0.00613	0.38322	-0.19755
	0.0045	0.9677	0.0086	0.1882
RIVU	0.81769	0.30375	-0.05807	-0.03688
	0.0001	0.0402	0.7015	0.8078
RIVW	-0.88244	-0.17112	0.01801	0.08910
	0.0001	0.2555	0.9055	0.5559
RVA	0.62309	-0.27537	-0.14200	-0.32259
	0.0001	0.0640	0.3465	0.0288
RVR	-0.42980	0.09550	0.03205	-0.12528
	0.0029	0.5278	0.8325	0.4068
RVU	0.42455	0.30504	-0.35871	0.42291
	0.0033	0.0393	0.0144	0.0034
RVW	-0.57703	-0.24966	0.41358	-0.31851
	0.0001	0.0943	0.0043	0.0310

low significance of the loadings of the third vector, no further information appears to be present in the male third vector.

The female loadings (Table 15) in vector 1 seem to follow the arch-whorl contrasts present in the male finger pattern results. Vector 2 is similar in that the ulnar patterns are positively loaded. But, instead of contrasting against arches as in the males, they are contrasting against whorls in the females. Since in all previous canonical analyses the females contained fewer significant vectors than the males, the second vector in the female finger patterns may or may not carry any significant meaning in its overall structure. The third vector shows only ulnar-whorl contrasts on the fifth finger, and its overall significance to population relationships is suspect.

Palm Pattern Results

Palmar patterns have not been used for population structure study in anthropology to the extent of finger and interdigital ridge-counts or finger patterns. The lack of systematic protocol on the various features may have contributed in this avoidance. Cummins and Midlo (1943), Holt (1968), Penrose and Loesch (1970) have established classifications for palmar patterns, but no one system has

Table 15. Female Finger Pattern Pearson Correlation Coefficients and Probabilities.

	VECT1	VECT2	VECT3	VECT4
LIA	0.81989 0.0001	-0.19768 0.2550	0.15045 0.3883	-0.37477 0.0265
LIR	-0.17398 0.3175	-0.18376 0.2907	-0.09058 0.6048	-0.07023 0.6885
LIU	0.50165 0.0021	0.59028 0.0002	0.12119 0.4880	0.01575 0.9285
LIW	-0.78274 0.0001	-0.30600 0.0738	-0.15997 0.3586	0.19172 0.2699
LIIA	0.81001 0.0001	0.00658 0.9701	-0.22042 0.2032	0.34640 0.0415
LIIR	0.42880 0.0102	-0.17895 0.3037	0.02320 0.8948	0.55000 0.0006
LIIU	-0.02528 0.8854	0.59330 0.0002	-0.13443 0.4413	-0.42108 0.0118
LIIW	-0.69252 0.0001	-0.47964 0.0036	0.26326 0.1265	-0.06482 0.7114
LIIIA	0.73795 0.0001	-0.35704 0.0352	-0.18127 0.2974	0.20287 0.2425
LIIIR	-0.01265 0.9425	-0.20478 0.2380	0.09580 0.5841	-0.15382 0.3777
LIIIU	0.06192 0.7238	0.59056 0.0002	0.13514 0.4389	0.04735 0.7871
LIIIW	-0.72697 0.0001	-0.28933 0.0918	-0.00774 0.9648	-0.22012 0.2039
LIVA	0.78884 0.0001	-0.31437 0.0659	-0.17731 0.3082	-0.14262 0.4138
LIVR	0.16944 0.3305	0.30490 0.0749	-0.32853 0.0540	0.33339 0.0503
LIVU	0.64390 0.0001	0.08625 0.6223	0.40426 0.0160	0.15796 0.3648
LIVW	-0.84782 0.0001	0.02551 0.8844	-0.20291 0.2424	-0.10624 0.5436
LVA	0.82647 0.0001	-0.30922 0.0707	-0.02877 0.8697	0.02043 0.9073
LVR	-0.06657 0.7040	0.11566 0.5082	-0.27914 0.1044	0.23256 0.1788
LVU	-0.16706 0.3375	0.42757 0.0104	0.61832 0.0001	-0.05566 0.7508
LVW	-0.59462 0.0002	-0.19725 0.2561	-0.63834 0.0001	0.00572 0.9740

Table 15. Continued.

	VECT1	VECT2	VECT3	VECT4
RIA	0.64360 0.0001	-0.17991 0.3011	0.04623 0.7920	-0.55647 0.0005
RIR	-0.26626 0.1221	-0.23515 0.1739	-0.09649 0.5813	0.05491 0.7540
RIU	0.50491 0.0020	0.67814 0.0001	-0.07785 0.6567	-0.00986 0.9552
RIW	-0.73558 0.0001	-0.48758 0.0030	0.05068 0.7725	0.27637 0.1080
RIIA	0.79275 0.0001	-0.21111 0.2235	-0.01735 0.9212	0.21673 0.2111
RIIR	0.39608 0.0185	-0.39532 0.0187	0.39843 0.0178	0.50935 0.0018
RIIU	0.08608 0.6229	0.76921 0.0001	-0.38684 0.0217	-0.06394 0.7152
RIIW	-0.65714 0.0001	-0.49261 0.0026	0.21328 0.2186	-0.28040 0.1028
RIIIA	0.75414 0.0001	-0.44735 0.0071	-0.15393 0.3773	0.14578 0.4034
RIIIR	-0.01293 0.9412	-0.08557 0.6250	0.06612 0.7059	0.18678 0.2827
RIIIU	0.07275 0.6779	0.92252 0.0001	-0.02547 0.8845	-0.06759 0.6997
RIIIW	-0.57052 0.0003	-0.70224 0.0001	0.12176 0.4860	-0.03843 0.8265
RIVA	0.79877 0.0001	-0.34206 0.0443	-0.20435 0.2390	-0.12353 0.4796
RIVR	0.38599 0.0220	0.08608 0.6229	-0.06761 0.6996	-0.21415 0.2167
RIVU	0.35760 0.0349	0.43840 0.0084	0.33995 0.0457	0.26266 0.1274
RIVW	-0.64904 0.0001	-0.30611 0.0737	-0.24576 0.1547	-0.18548 0.2861
RVA	0.79420 0.0001	-0.24700 0.1526	0.03862 0.8257	0.01350 0.9386
RVR	0.51228 0.0017	0.09807 0.5752	-0.30786 0.0720	-0.10579 0.5453
RVU	-0.07008 0.6891	0.48074 0.0035	0.54684 0.0007	-0.13276 0.4471
RVW	-0.60531 0.0001	-0.32198 0.0593	-0.57720 0.0003	0.13845 0.4277

yet been consistently employed. And even though Loesch (1974) and Holt (1961) have shown the significant genetic and familial correlative nature of palmar dermatoglyphics, the genetic basis for these relationships has not been fully investigated, leaving a void in the understanding of this dermatoglyphic system.

To encompass all aspects of dermatoglyphic study in this analysis, palmar patterns were also included. Just as was the case in the finger pattern frequency analysis, palmar pattern frequencies have not been tested for significance by canonical methods because of their qualitative nature. Thus, only by the conformity of the palm pattern results to the previous dermatoglyphic results can any significant relationship to the overall analytical nature of palmar pattern frequencies be evaluated in this population study.

The male correlation coefficients (Table 16) for Vector 1 indicate significant contrasting loadings in the thenar, third and fourth palmar areas for both hands. The open fields are negatively loaded and the patterns are positively loaded. Only the hypothenar area is heavily weighted in the second vector with contrasting loadings for the fields in both hands.

The resulting principal coordinate plot from these two vectors (Figure 20) loosely follows the distributions

Table 16. Male Palmar Pattern Pearson Correlation Coefficients and Probabilities.

		VECT1	VECT2	VECT3	VECT4
LEFT	H O	-0.62990 0.0001	0.70520 0.0001	-0.13920 0.3733	-0.22832 0.1409
	H O/O	0.44294 0.0029	-0.87613 0.0001	-0.00785 0.9601	-0.11643 0.4572
	H Lr	0.35948 0.0179	0.32591 0.0329	0.33112 0.0301	0.69042 0.0001
	T O	-0.72312 0.0001	-0.13653 0.3826	0.35703 0.0188	0.36674 0.0156
	T O/Q	0.75508 0.0001	0.31315 0.0409	-0.17453 0.2630	-0.23867 0.1232
	II O	-0.47057 0.0015	0.03748 0.8114	0.18435 0.2366	-0.19755 0.2041
	III O	-0.83722 0.0001	-0.30712 0.0451	-0.09295 0.5533	-0.03568 0.8203
	III L	0.78858 0.0001	0.39483 0.0088	0.07264 0.6434	-0.01972 0.9001
	IV O	0.04180 0.7901	-0.08023 0.6091	-0.88648 0.0001	0.33108 0.0301
	IV L	-0.57270 0.0001	-0.27281 0.0767	0.38185 0.0115	-0.31171 0.0419
	IV D	0.61703 0.0001	0.29481 0.0550	0.34124 0.0251	-0.09816 0.5312
RIGHT	H O	-0.49440 0.0008	0.59729 0.0001	-0.17158 0.2713	-0.05095 0.7456
	H O/O	0.31525 0.0395	-0.76178 0.0001	-0.02281 0.8846	-0.12155 0.4375
	H Lr	0.12231 0.4346	0.21099 0.1744	0.24118 0.1192	0.25201 0.1030
	T O	-0.68948 0.0001	-0.23758 0.1250	0.21264 0.1710	0.30702 0.0452
	T O/Q	0.67019 0.0001	0.19393 0.2127	-0.23432 0.1304	-0.31676 0.0385
	II O	-0.56034 0.0001	0.04429 0.7779	0.28461 0.0643	-0.04715 0.7640
	III O	-0.72704 0.0001	-0.36414 0.0164	0.12307 0.4317	-0.03367 0.8303
	III L	0.67519 0.0001	0.33712 0.0271	-0.14611 0.3498	0.02710 0.8631
	IV O	0.12082 0.4403	0.03934 0.8022	-0.61728 0.0001	0.19781 0.2036
	IV L	-0.49952 0.0007	-0.31229 0.0415	0.43718 0.0034	-0.35342 0.0201
	IV D	0.56465 0.0001	0.35373 0.0200	0.13835 0.3763	0.23729 0.1255

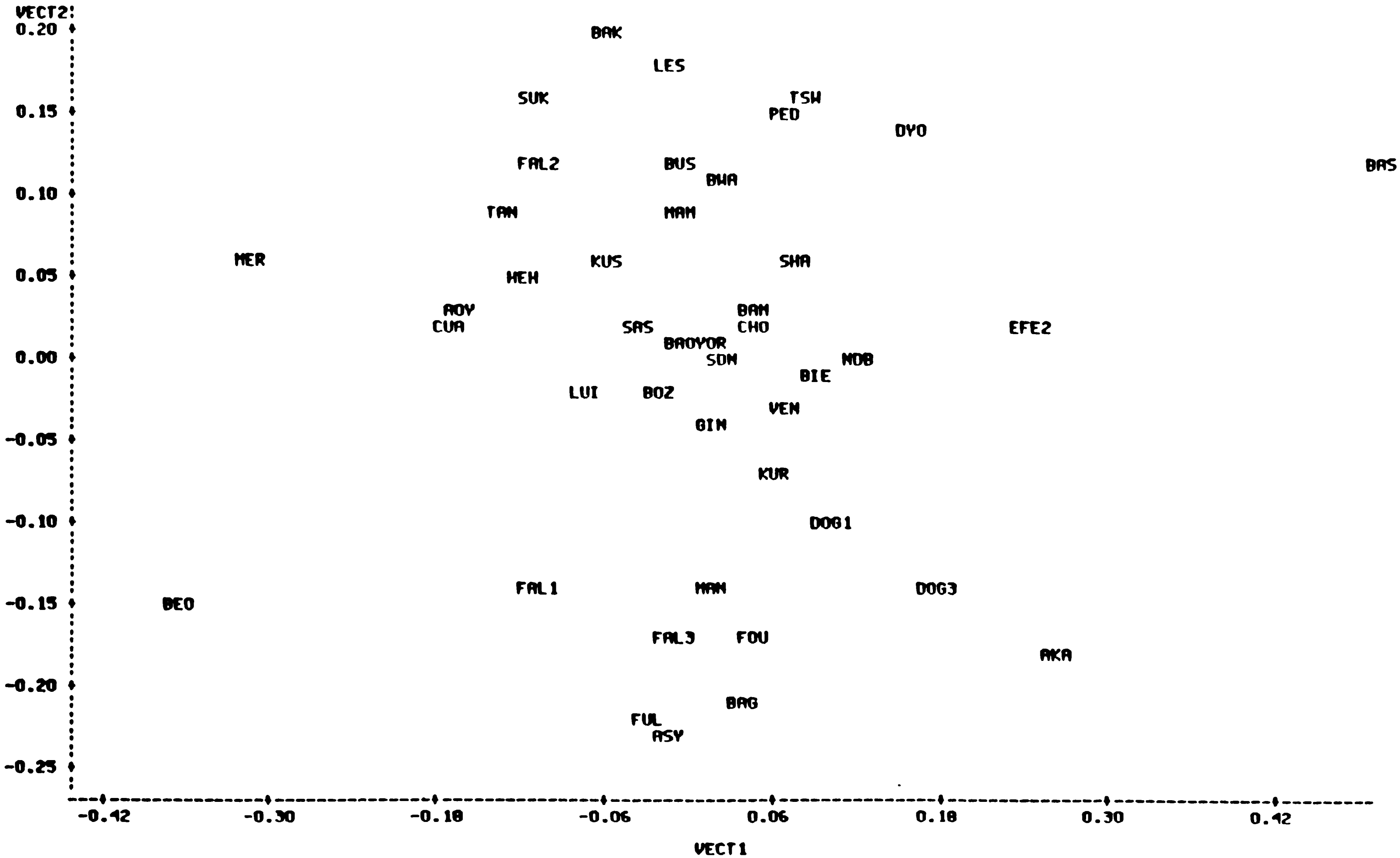


Figure 20. Male Palmar Pattern Frequency Bivariate Plot of Vector 2 Versus Vector 1.

made by the palmar interdigital ridge-counts. The Bushmen are no longer at one extreme of Vector 1, but instead, the Basua Pygmees are the most differentiated positively. At the other end of the spectrum the Madagascaran groups are separated from the main group clusters. Not all of the Madagascaran groups are delineated from the larger cluster however. Instead, they are interspersed within the periphery of the left side of the larger group cloud. There is wide dispersion of related tribes within the center of the plot with the Angolans in the center, the Pygmees to the right and the South Africans in the lower right portion.

Population structuring is even less visible in the plot produced by Vector 3 and Vector 1 (Figure 21). Vector 3 is generated by various bimanual loadings which do not seem to follow any understandable relationship other than contrasting loadings in the third field. From this pattern it appears the third vector may not be significant to the overall canonical structure. The groups are collapsed on Vector 3 into a small region making the only group separation apparent on Vector 1. Therefore, this clustering is essentially the same as found in the previous plot.

The female correlation coefficients for palmar pattern frequencies are presented in Table 17. The first

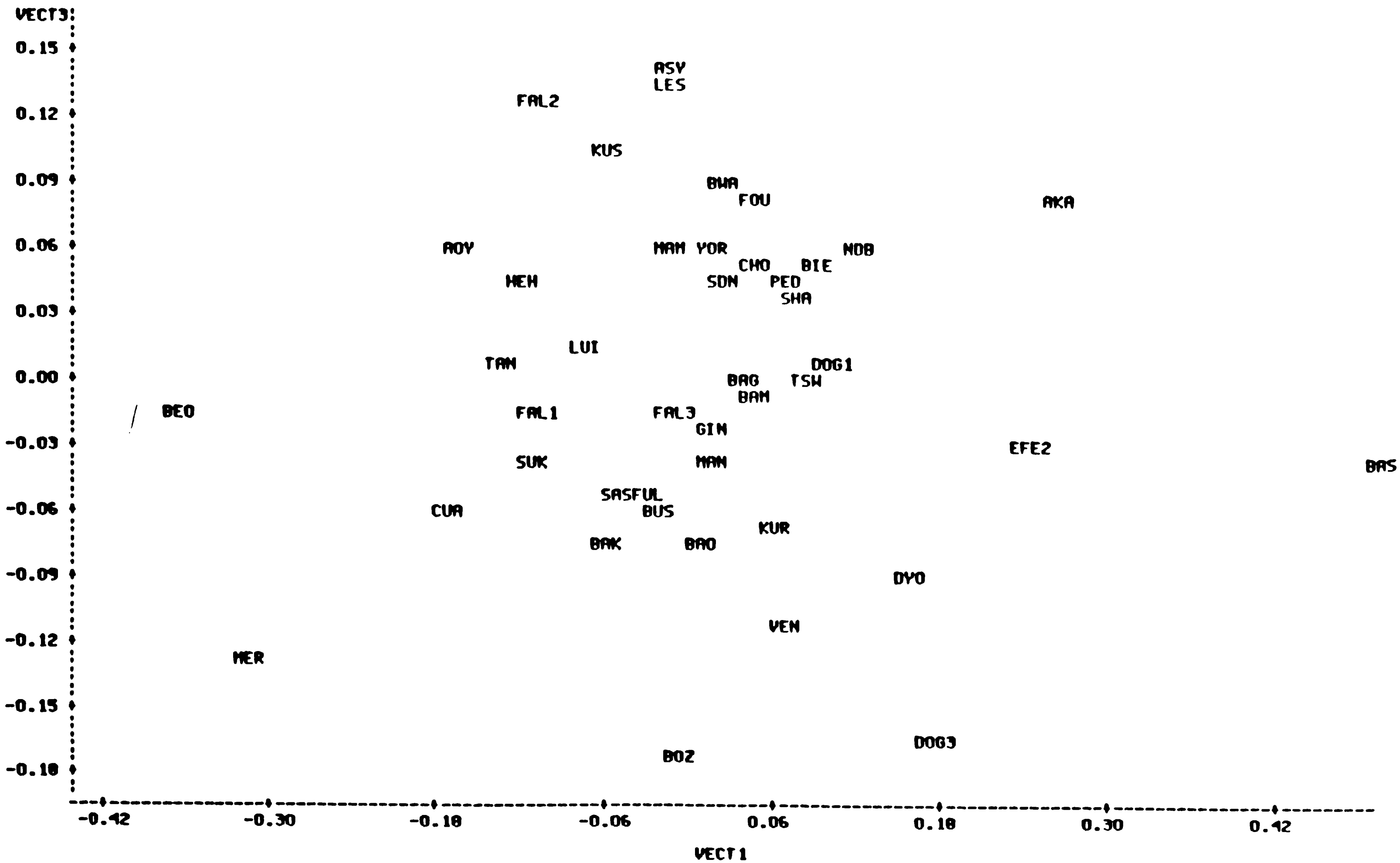


Figure 21. Male Palmar Pattern Frequency Bivariate Plot of Vector 3 Versus Vector 1.

Table 17. Female Palmar Pattern Pearson Correlation Coefficients and Probabilities.

		VECT1	VECT2	VECT3	VECT4
LEFT	H O	0.79541 0.0001	0.35980 0.0431	-0.02192 0.9052	0.45205 0.0094
	H O/O	-0.67996 0.0001	-0.69699 0.0001	0.11620 0.5265	-0.03443 0.8516
	H Lr	-0.07920 0.6666	0.61769 0.0002	-0.06889 0.7079	-0.62725 0.0001
	T O	-0.66276 0.0001	0.43676 0.0124	-0.45851 0.0083	0.12957 0.4797
	T O/Q	0.73728 0.0001	-0.39576 0.0250	0.49786 0.0037	-0.13410 0.4643
	II O	-0.22669 0.2121	0.40944 0.0200	-0.11577 0.5281	0.11355 0.5360
	III O	-0.43914 0.0119	0.51881 0.0024	0.53585 0.0016	0.08669 0.6371
	III L	0.42282 0.0159	-0.34294 0.0547	-0.70343 0.0001	-0.13887 0.4484
	IV O	0.36331 0.0410	0.15372 0.4009	-0.22163 0.2228	-0.61635 0.0002
	IV L	-0.48956 0.0045	0.36852 0.0379	0.46226 0.0077	0.24945 0.1686
	IV D	0.20826 0.2527	-0.52393 0.0021	-0.51144 0.0028	0.24383 0.1787
RIGHT	H O	0.72823 0.0001	0.13209 0.4711	-0.13838 0.4501	0.33630 0.0598
	H O/O	-0.66249 0.0001	-0.45580 0.0088	0.04667 0.7998	-0.13689 0.4550
	H Lr	-0.10549 0.5656	0.35375 0.0470	0.03823 0.8354	-0.26623 0.1408
	T O	-0.41982 0.0168	0.38515 0.0295	-0.13153 0.4730	0.10191 0.5789
	T O/Q	0.54862 0.0012	-0.48549 0.0049	0.12961 0.4795	-0.05705 0.7565
	II O	-0.32065 0.0736	0.60331 0.0003	0.08250 0.6535	0.05973 0.7454
	III O	-0.33035 0.0648	0.59953 0.0003	0.41170 0.0192	0.07309 0.6910
	III L	0.27430 0.1287	-0.36116 0.0423	-0.58199 0.0005	-0.10999 0.5490
	IV O	0.48669 0.0047	-0.04333 0.8139	-0.23784 0.1899	0.02080 0.9101
	IV L	-0.37847 0.0327	0.25099 0.1659	0.35072 0.0491	0.07135 0.6980
	IV D	-0.14488 0.4289	-0.22957 0.2062	-0.00182 0.9921	-0.06726 0.7146

vector has bimanually contrasted loadings for the hypothenar and thenar areas while the open fields are positively loaded and the patterns negatively loaded. Interestingly, there is a contrast in the fourth interdigital area across the hands, the left is negative and the right positive. The meaning for this cross hand relationship is not understood. The second vector has bimanual loadings in the hypothenar and third interdigital open fields, and various other loadings of left H Lr, IV D and right T O/Q. The third vector has bimanual contrasting loadings of the third interdigital area, the left thenar and the fourth area.

Female population distributions (Figures 22 and 23) separate the Bushmen from all other groups, as was found in the finger results. But other than this separation, the groups fail to form evenly dispersed clusters of related tribes. Even the Pygmees are interspersed with Angolan and South African groups. This lack of clarity in the distribution plots is consistent with the results produced by the female palmar interdigital ridge-counts.

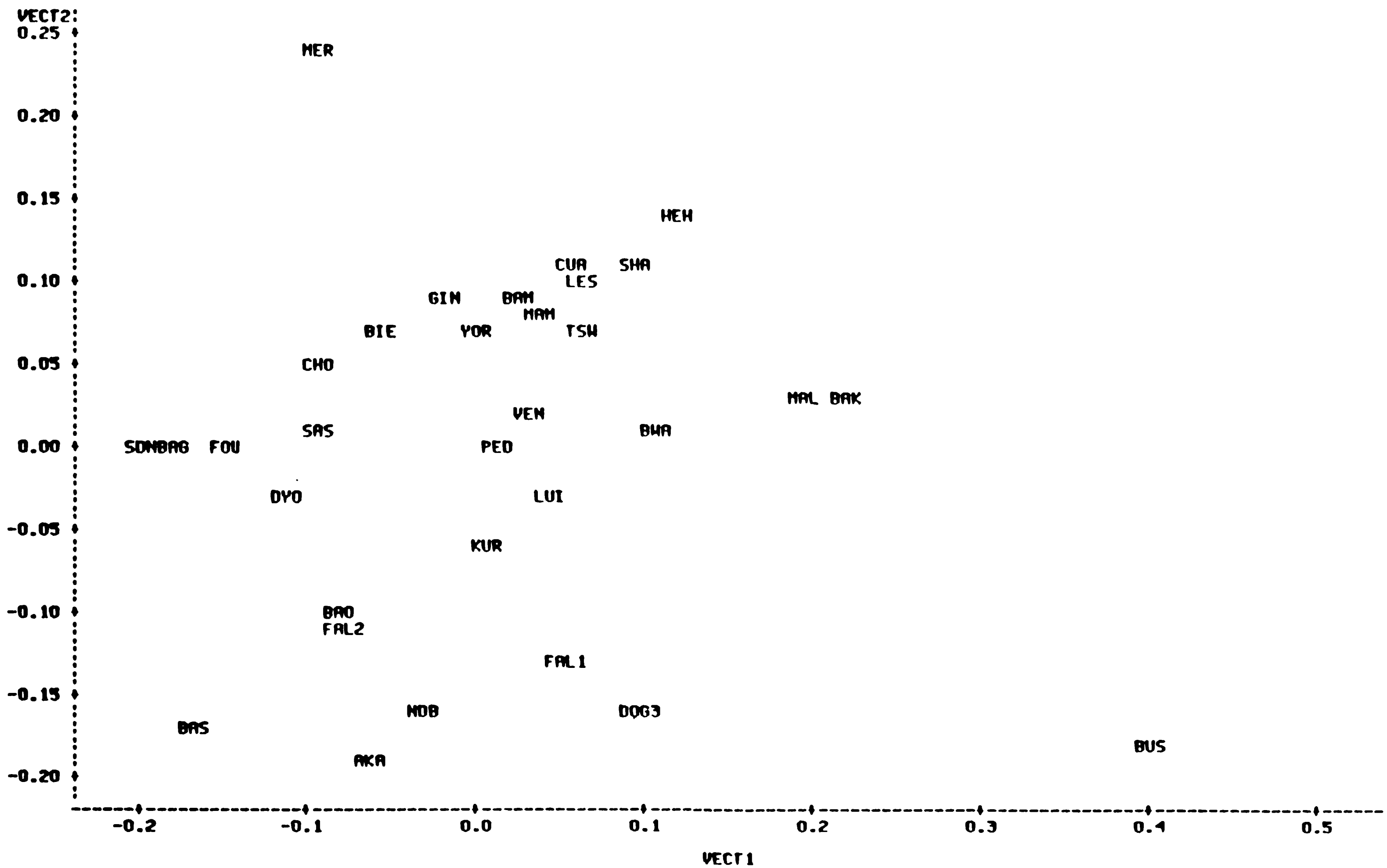


Figure 22. Female Palmar Pattern Frequency Bivariate Plot of Vector 2 Versus Vector 1.

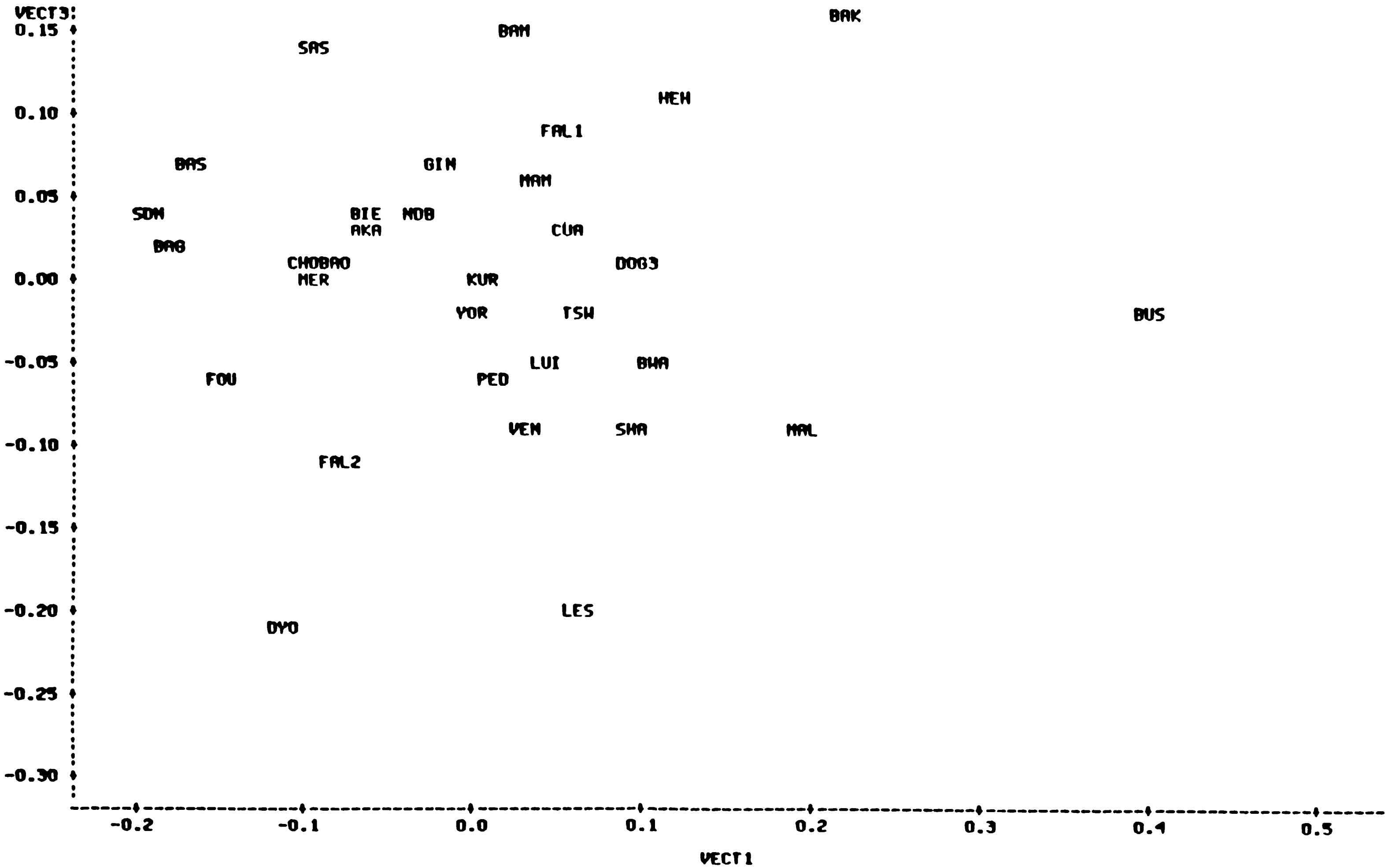


Figure 23. Female Palmar Pattern Frequency Bivariate Plot of Vector 3 Versus Vector 1.

Dermatoglyphic Method Comparisons by D-Square Distance

10 Count Versus 20 Count Intra-Sex Comparisons

The intra-sex finger ridge-count distance matrix comparisons are presented below in Table 18.

Table 18. Intra-Sex Distance Correlations Between the 10 and 20 Finger Ridge-Count Dermatoglyphic Distance Matrices.

	20 count (M)	20 count (F)
10 count (M)	.8640**	
10 count (F)		.9042**

** $p < .01$

The male comparisons are slightly lower than the females, but both sexes show about a 20% (25% for males, 18% for females) loss of shared information by using 10 ridge-count variables. By the exclusion of the smaller ridge-count value on each finger, there is a significant loss of information available to distinguish group relationships and population distributions. This is visually borne out by the reduced clarity of group clustering formed by the 10 and 20 count principal coordinate plots discussed above.

It can be expected that the D-square correlations will fluctuate between population comparisons depending on the group ridge-count means. Since the major difference between a 10 and 20 count data set is the inclusion of the lower ridge-count on whorls, a population with relatively low whorl patterns may be less subject to information loss than a higher whorl frequency population. Since the 10 count method still requires determination of the greater count from a whorl, why not complete the process and systematically include both counts in the data set. It is evident from the above results that 20 counts have an approximate 20% advantage over the 10 count method. This advantage contains additional information relevant in identifying subtle population relationships.

Inter-Sex Ridge-Count Method Distance Comparisons

In the above D-square matrix comparisons, only intra-sex comparisons could be made because the number of female and male groups did not match. Therefore, groups not found in either sex data sets were excluded, leaving 34 finger and 31 palmar interdigital-count data sets. Intra- and inter-sex distance matrix correlations were then re-calculated for both the finger and palm ridge-count data sets (Table 19). The intra-sex correlations indicate little change from the previous intra-sex correlations. Removal of these groups had little effect on the

Table 19. Inter-sex Pearson Correlations Between 10 and 20 Finger and Palmar Interdigital Ridge-Count Dermatoglyphic Distance Matrices.

	1	2	3	4	5	6
1. 10 count(M)	1.0					
2. 10 count(F)	.687**	1.0				
3. 20 count(M)	.910**	.621**	1.0			
4. 20 count(F)	.728**	.901**	.683**	1.0		
5. Palm count(M)	---	---	---	---	1.0	
6. Palm count(F)	---	---	---	---	.432**	1.0

** $p < .01$

correlations. The male intra-sex correlation did increase slightly, becoming equivalent to the female correlation (a minor change of 8%).

The inter-sex and the 10 versus 20 count correlations are not balanced, but tend to reflect expected patterns. The male 10 count and female 20 count matrices contain a higher amount of shared information, thus producing a higher correlation than the other inter-sex matrix comparisons. The group distance information is the lowest in the female 10 count matrix. Thus, all comparisons with this distance matrix will be slightly lower than the other correlations.

Some of the most interesting results from the distance comparison analyses are in the palm count correlations. Table 19 shows the male versus female palm correlation to be .432, (about 19% of shared variation). This is more than 25% lower than shared information between sex finger ridge-count comparisons. The low palm count correlation suggests there is different information between sexes, a feature present but not as prominent in finger ridge-counts.

There must be some developmental differences between the palms and the fingers to cause this variation in the correlation results. Since palmar skin ridging and patterns begin to develop later than the fingers, there may be added influences of foetal hormones, longer periods for environmental expression in the palm development, genetic controls governed by sex of the fetus, or combination of all the above factors. Whatever the case, the different influences make palmar dermatoglyphic information different from and possibly as important as finger dermatoglyphic variables.

Inter-Ridge-Count D-Square Matrix Comparisons

At the previous level, the data sets still contained an incompatible number of groups (34 and 31, respectively). In a final comparative level, the finger ridge-count and palm ridge-count data sets were again reduced, including only those tribes present in both of the dermatoglyphic sets. The resulting matrices contain 29 groups. D-square distance comparisons were again calculated and significance tests were generated (Table 20). Re-evaluation of the previous D-square distance correlations show minimal loss of pertinent information with the reduction of the data sets. The elimination of those groups not found in both matrices did not drastically effect the overall structure of the D-square analysis.

Table 20. Inter-Dermatoglyphic Ridge-Count and Sex Distance Matrix Pearson Correlations.

	1	2	3	4	5	6
1. 10 count(M)	1.0					
2. 10 count(F)	.719**	1.0				
3. 20 count(M)	.913**	.644**	1.0			
4. 20 count(F)	.777**	.900**	.719**	1.0		
5. Palm count(M)	.393*	.332*	.425**	.413*	1.0	
6. Palm count(F)	.444**	.430**	.472**	.453**	.442**	1.0

** $p < .01$
* $p < .05$

The palm-finger correlations are of the most interest in this comparison. All correlations indicate a marginal 17-22% of shared information between the matrices. Suprisingly, consistently higher correlations are found in the females. Even though all male correlations are significant at the $p < .05$ level, the palm count matrices are less comparable to the other distance matrices. This patterning does not reflect the relationships shown in the previous results. There must be a higher amount of intra-group heterogeneity in the male samples which effected the level of shared information between the D-square matrices.

Quantitative Versus Qualitative Correlation Differences

Distance matrices were also generated to compare ridge-count results with those produced by qualitative identifications. Comparison tests were made at the highest level where the male matrices contained 46 groups and the female matrices contained 35 groups. Table 21 gives the D-square matrix correlations calculated from these comparisons. Generally, the correlations are similar for the sexes, much as was seen in the finger ridge-count distance comparisons.

Table 21. Pearson Correlations Between Qualitative and Quantitative Finger Dermatoglyphic Distance Matrices.

Finger Ridge-Counts	Patterns Male	Patterns Female
Male 10 count	.75060**	
Female 10 count		.74766**
Male 20 count	.82551**	
Female 20 count		.78961**

** p <.01

The male correlations are slightly higher than the females, but this is certainly not significant. The loss of information between the qualitative and the quantitative methods is at a similar level to the two ridge-count methods, containing 55-68% of the same information as from finger pattern analysis. Referring back to the principal coordinate plots of these data sets, the finger patterns are more reminiscent of the 20 count distributions than the 10 count. Evidently, the amount of shared information is essentially equal between the finger pattern, 10 count and 20 count distances. Although these correlations may not be found in other population analyses, in the African samples the finger pattern distributions appear to function as well as the 10 count variables. This may support Holt's (1968) contention that

10 counts quantify finger pattern size, and in this case, the primary variable identification among African populations.

Language Versus Geography Distance Correlations

Matrix comparisons of linguistic and geographic distances were made to quantify shared distances between these two variables. Language is usually well nested in geography, since linguistic affinities are influenced by geographic isolation. The results from the language versus geography comparisons in this study indicate a lower, but still significant amount of this expected confounding in Sub-Saharan Africa.

Table 22. Pearson Correlations Between Language and Geography Distance Matrices for Finger and Palmar Data Sets.

Dermatoglyphic variables	N	Language-Geography Correlations
Male finger sample	(46)	.32347**
Female finger sample	(35)	.16827**
Male palm sample	(43)	.34891**
Female palm sample	(31)	.19350*

** p <.01
* P <.05

Due to a greater separation of groups in the males generated by inter-group variation, their correlations are higher than the females. This difference in correlation may also be attributed to variation due to missing groups between sexes. Some of the samples are found in the male data set but not in the female data set and they may generate better differentiation (e.g. the Madagascaran groups).

This study used the higher levels of Greenberg's linguistic classification to label the linguistic affiliation of the various groups. Since the Bantu language is found in virtually all regions of Africa, the confounding of geography and language is expected to be less. Thus, the low language-geography correlations produced above are merely a reflection of an inadequate linguistic classification level for the distribution. From the results, it is recommended that further investigation in African population relationships using linguistic distances should be made on narrower dialectical levels, such as those proposed by Bastin, et al. (1983).

Dermatoglyphic Versus Language and Geography Distances

Geographic Relationships to Dermatoglyphic Traits

Table 23 presents the correlations between the dermatoglyphic and geographic distances. Nearly all the correlations are zero or approximately zero except for the male finger ridge-counts. The 20 count data set has a lower correlation (4% shared information) but is significant at p=.01. This significance is borne out in the bivariate principal coordinate plots. The 10 count data set is significant below p <.05. This is reflected in the less concise geographic distributions seen in the 10 count plots, and the absence of patterning in the female results.

Genetic or phenotypic affinities among the groups have effectively reduced the level of geographic correlation. The Bushmen should align with the Angolan tribes, or with those South African tribes having high amounts of Khoisan admixture. But in fact, they more closely associate with the Pygmee groups, based on their lower overall ridge-count values. The West and South African Negroid groups follow more biological clustering than geographic separation because of their relatively recent divergence from a common ancestry.

Table 23. Pearson Correlations Between Geographic and Finger and Palmar Dermatoglyphic Distance Matrices.

	Males	Females
1. 10 count (M)	.12745*	
2. 10 count (F)		-.02367
3. 20 count (M)	.20534*	
4 20 count (F)		-.01906
5. Palm count (M)	.04221	
6. Palm count (F)		.02161
7. Finger patterns (M)	.12410*	
8. Finger patterns (F)		.00400
9. Palm patterns (M)	-.03601	
10. Palm patterns (F)		-.04230

* p <.05

Linguistic Relationships to Dermatoglyphics

Matrix comparison correlations between dermatoglyphic and linguistic distances are presented in Table 24. The correlations are generally around .35-.45 (12-20% shared information) with all finger ridge-count comparisons significant below $p < .01$ and palm count comparisons being at $p = .01$. As has been the pattern in most of the previous results, the male comparisons contain more shared information. But in the palmar ridge-count comparisons, this pattern is reversed. The reason for this conversion is not known. The male palm ridge-counts are noticeably lower than the rest of the correlations. The reason for this is not clear, nor does it follow previously seen patterns in the results.

Table 24. Pearson Correlations Between Linguistic and Finger and Palmar Dermatoglyphic Distance Matrices.

	Males	Females
1. 10 count (M)	.35416**	
2. 10 count (F)		.41465**
3. 20 count (M)	.39850**	
4. 20 count (F)		.44731**
5. Palm count (M)	.17754**	
6. Palm count (F)		.32920**
7. Finger patterns (M)	.39646**	
8. Finger patterns (F)		.44437**
9. Palm patterns (M)	-.09070*	
10. Palm patterns (F)		.11881*

** p <.01
* p <.05

These results agree with Dow, et al.'s (1987) significant linguistic-dermatoglyphic correlations in New Guinea populations. The African correlations are not as strong as Dow's findings, but they definitely conform to Friedlaender's (1975) contention for strong linguistic-dermatoglyphic affinities. It seems, however, that this relatively significant language-dermatoglyphic relationship should be lower since the results of the geographic distance comparisons are marginally correlated. Because the Bantu language covers such a broad amalgamation of people, one expects the inter-group variation should disrupt any group affiliations. The correlations must reflect the common ancestry of amounts of gene flow between the indigenous groups and the Negroid peoples during their migrations into Southern Africa. The correlations found in this analysis indicate biological similarity between tribes across Sub-Saharan Africa by genetic transfer in conjunction with cultural and linguistic integration. These conclusions are then in direct support of the Bantu expansion hypothesis as an explanation for present day African population structuring.

V. DISCUSSION

The goals of this investigation were to determine the effectiveness of dermatoglyphic features to form relevant population structure in African samples, test these population relationships by distance analysis to identify which dermatoglyphic methods best represents these structures and to compare these results to population relationships found in previous African biological studies. Discussion of this studies findings will be divided into four sections below; Geographic and linguistic patterning of dermatoglyphic variation, dermatoglyphic method effectiveness, and the relationships between this study's population structures and that found in previous research.

Geographic Patterning of Dermatoglyphic Variation

As indicated in the principal coordinate plots, the African groups in this study conform to cultural, biological or geographical clustering comensurate with historic, genetic or cultural relationships reported in previous studies. But despite this general overall conformity, not all individual groups align to the expected patterns of association. Because of these disturbances in group distances, the dermatoglyphic correlations to the geographic distance matrix are not significant to the $p < .01$ level. It was somewhat disappointing to have this lack of significance, particularly in light of previous studies.

Lestrange (1953) and Gessain (1957) have identified north-south whorl clines in African populations, a feature which has repeatedly been observed in subsequent studies on this subject. These clines have been attributed to influences of climate on body morphology and thus on dermatoglyphic features. Jantz and Hawkinson (1979) found inter-finger ridge-count contrast variability also followed definite geographical patterning in Africa. They also suggested these geographic patterns influence dermatoglyphic features, either by genetic relationships, by factors of climate or environment or by combinations of the above. In contrast, Hiernaux (1968) and Hiernaux and Fromet (1976) found no distinct geographic patterning of dermatoglyphic variables in their African samples. The lack of significant conformity in the present data may be an artifact of dermatoglyphic variation more relevant to genetic constraints than to geographic isolation mechanisms.

South African and Angolan Populations

In most all the results, the Venda and the Cuanhama also do not conform to geographical expectations, associating with the West African cluster. This differentiating trend in the Venda has also been observed in craniometric analysis by Rightmire (1976) and in serological study by Hitzeroth, et al. (1981). Hitzeroth (1986) identifies the Venda as an independent linguistic stock which migrated into the Sotho region. It is thought that these linguistic differences along with the influence of a later migration into South Africa have kept the Venda differentiated despite their high amount of Khoisan admixture (38%)(Jenkins, et al., 1970).

Variation between the Venda and other South African tribes has been attributed to Khoisan admixture by Ojikutu, et al. (1977)and by Jenkins, et al.(1970) using Gm^{13} and p^r allele frequencies. The Tswana have the highest Khoisan admixture frequency at 53-54%, primarily because they incorporated Khoisan groups as slaves (Hiernaux, 1975:101). The Pedi and the Shangana have the next highest admixture, 17-22% and 15%, respectively. In the males these two groups do not align as closely with one another as they do in the females. This may be because the Pedi are a intrusive group from the Transvaal while the Shangana are a fusion of the Tsonga and Shona from

Southern Mozambique (Hitzeroth, 1986). The Ndebele are differentiated from the other groups by the lowest frequencies (5%) because they have remained genetically separate since their migration from the southeast coastal region.

The Cuanhama of southern Angola are a distinct cultural group of Bantu-speakers. This distinctiveness must include cultural and biological isolation (suggestive in the < 5% Khoisan admixture) enabling the population to retain much of its genetic continuity with Western Bantu groups. Although this West Bantu relationship is much more pronounced in the male distribution, they still remain separate from the other Angolan groups in the female plot but cluster more with the South Africans.

The consistent closeness of the four Angolan groups (Bieno, Luimbe, Chokwe, Ginga) within all the dermatoglyphic analyses should be pointed out. These four groups ally with the South African groups, but are tend to cluster on both axes. These relatively small group distances have also been found by Rösing (1977) in an anthropometric study of Angolans. He found the Bieno and Luimbe to be especially close. The results from the dermatoglyphics do not follow distance relationships between other tribal groups but they do identify with Rösing's Angolans.

West African Populations

Jantz, et al. (1982) found the Yoruba to cluster with the South African Bantu-speakers in both sexes. This same relationship is not present in this analysis. In both the males and the females, the Yoruba are well contained in the West African cluster, positioned with another West coastal group, the Baoule. During the time of the West African "state" societies, the Yoruba and Baoule were both strong societies, and trade was quite widespread between these coastal states. It is likely that gene flow between these two powerful societies was high. Even after collapse of the "state" societies, genetic transfer has undoubtedly continued by intermarriage in urban settlements.

The Western groups do not appear to cluster into regional groups such as Western Interior (KUR, FUL, DOG, SAS, etc.), West Coastal (DYO, BAG) or Nigerian/Cameroon (YOR, MAM, BAM, FAL, etc.) as might be expected. The western Bantu (Negroid) groups at the present analytical level appear to be quite dermatoglyphically homogeneous. At a more regional level these geographic distinctions may or may not become clear. One particularly interesting feature with the Western cluster is the presence of western Pygmee groups as well as a few of the Eastern Pygmee groups (LES, MAN) on the positive fringe of the finger ridge-count plots. Historical accounts of the Eastern Pygmee groups indicate that all groups have had some level of Negroid genetic admixture through trade or "protection" relationships with Bantu immigrants. The level of hybridization has been dictated by cultural constraints, thus resulting in some Pygmee groups being rather genetically heterogeneous while others are relatively free of Negroid admixture by marriage taboos (Schebasta, 1938; Hiernaux, 1966). The reason why the Lese and Mangbetu Pygmees cluster more closely with the Western Bantu may be a result of canalization of the Pygmee form. It has been proposed by Jantz, et al. (1982) that there is little or no dermatoglyphic intermediates between Black and White, and Black and Indian hybrids. The Cape Coloured in their analysis tended to be further removed from the Black Africa cluster and more closely related to European or Indian groups in all cases, particularly in the females. This same lack of intermediates was present in the dermatoglyphics of the Rehobother Bastard community of Nimibia (Hitzeroth, Brehme and Jantz, 1986).

Singh (1979) and Spence, et al. (1977) have suggested a European genetic dominance in dermatoglyphic variance. The present results suggest there may also be a Negroid genetic dominance over Pygmee dermatoglyphic features. Different genetic makeup or controls on growth factors may have a decided effect on dermatoglyphic expression and therefore have a threshold value which does not allow intermediate variances. It is apparent that there needs to be further study along these lines.

Pygmee and Bushman Populations

The Bushman are separated from all other groups in almost every aspect of the analysis, yet they are geographically close to the Angolan tribes (Bieno, Luimbe, Ginga, Chokwe, Cuanhama). This separation is generated by the first canonical component as the result of overall ridge-count size. As a result of this overall size control by the first vector, the eastern Pygmee groups (Aka, Basua, Efe), Are the most closely related population as reflected by their significantly low ridge-count values (Glanville, 1969). Therefore, the genetic control of ridge-counts affected by body size appears to be the factor causing degradation of geographic relativity.

There has been a great deal of study on the factors causing the distinct Pygmee body form (see Cavalli-Sforza, (1986a). Mann, et al. (1962) indicated they found no adolescent growth spurt in their sample of Congo Pygmees. Further substantiation of these findings has been noted by J.P. Hallet (unpublished; Cavalli-Sforza, 1986b) in Ituri Pygmees from Beni. Aka growth curves presented by van de

Koppel and Hewlett (1986) also identified this same absence of adolescent growth, and related it to low levels of Insulin-like Growth Factor I found in their Central African Republic (C.A.R.) Pygmees. The Pygmee children did not show reduced growth rates in early childhood, being 18th in overall size out of 89 study groups at 3 years of age, yet, at adolescence there was a marked lack of growth in both sexes. (van de Koppel and Hewlett, 1986:102).

The ability of Pygmees to metabolize and respond to Insulin-like Growth Factor I and human Growth Hormone (hGH) has been studied by Merimee, et al. (1981) and Merimee and Rimoin (1986). Results from tests of insulin-induced hypoglycemia showed the failure of C.A.R. Pygmees to return to normal plasma glucose levels by the standard 90 minute interval found in normal subjects. This response has generally been associated with plasma glucose deviations present in pituitary dwarfs with Isolated Growth Hormone Deficiency (IGHD)(Cerasi and Luft, 1963). In contrast to IGHD deficiency however, normal levels of plasma immunoreactive hGH were found in the Pygmee sample. This led Merimee and Rimoin (1986:170) to conclude that the Pygmees either secrete an altered hGH molecule, or they have unresponsive peripheral tissue sensitivity to normal hormones.

The second part of Merimee and Hewlett's study followed up their latter suggestion, since it conformed to other suggestions along these lines (Merimee, et al., 1972; Rimoin, et al., 1971). This investigation concludes that the short stature in Pygmees may be a response to hypo-sensitivity to the growth-promoting properties hGH. But this may only be a secondary effect in conjunction with other genetic factors influencing Pygmee body size.

If Pygmees represent a population exhibiting a form of hypo-pituitary dwarfism regulated by tissue sensitivity to growth hormones, then it follows that physical systems other than just stature are involved. Cheek (1968) has shown that pituitary dwarfs have less relative muscle mass in the peripheral body (arms and legs), a feature also identified in absolute weight distributions of Pygmees (Cavalli-Sforza, 1986:398). If there is decreased growth influence on peripheral mesoderm formation of muscle mass, this tissue hypo-sensitivity may also effect intra-uterine formation and development of dermal pads in Pygmee individuals. If dermal pad size and shape are reduced, lower dermatoglyphic pattern size and ridge-count values would result. Findings by Babler (1978;1979) have indicated reduced pad height directly effects dermal ridge formation and pattern shape. The low ridge-count values found in African Pygmees may reflect genetically induced growth controls on an individual, and may be part of the reason for the canalized dermatoglyphic variances present in the results. This hypothesis needs further investigation to explain the reasons for relatively high ridge-count values present in Oceanic pygmoid populations, and in other small body form populations throughout the world. Since dermatoglyphic features are not single dominant controlled traits, several additional environmental or genetic factors may be involved which cause differences in dermatoglyphic features.

Even though the dermatoglyphic-geographic correlations in this study are not statistically significant, it appears there is observable geographic structure to the populations in this study. If the samples which disturb the overall trends were removed or re-evaluated to conform to a different distance structure, it is believed that the results in this analysis would support the contention that dermatoglyphics can make population distinctions following geographic patterns.

Linguistic Patterning in Dermatoglyphic Variation

The results of the linguistic relationships shown in the distance comparisons are low, but still acceptably significant at the $p < .01$ level. The lower correlations may be attributed to the nature of the linguistic classifications used in this analysis. If a finer dialectical classification and higher order distance generation had been employed, the correlations would probably have increased. Since Greenberg's (1966) linguistic analysis is under re-examination and interpretation by Vansina (1984) and by Bastin, et al. (1979:1983) it may be suggested that further comparative study of African dermatoglyphic-linguistic relationships be made with this new linguistic classificatory system.

Despite the relatively low linguistic correlations, the significant nature of the results in this investigation support linguistic-dermatoglyphic relationships identified by Friedlaender (1975) and reiterated by Dow, et al. (1987). The biological homogeneity present in the dermatoglyphic variables correspond to the close linguistic affinities of the West and South African Bantu-speakers. The hypothesis that population migrations of West Africans into southern Africa during the recent past, best explains the relationships present in this study. Those South African groups which do not clearly aggregate with the Negroid cluster are probably influenced by the amount of Khoisan admixture affecting their dermatoglyphic variances. It can be concluded by linguistic distance relationships that

Greenberg's and Gutherie's interpretations of African prehistoric population movements are concordant with the population structures present in these dermatoglyphic results.

Dermatoglyphic Population Structures in Relation to Other Biological Studies

The second facet of this investigation was to compare the dermatoglyphic results with population structures produced by other biological systems. These comparisons are not intended to be on the level or depth as was done by Hiernaux (1968), making distance comparisons of dermatoglyphics, serology and craniometrics. To do this would require using literature data for comparison to the dermatoglyphic data, resulting in the same inter-observer problems Hiernaux faced. One of the designs of this thesis was to use a dermatoglyphic data set which was investigated and categorized by a single individual, in order to avoid inter-observer problems. Therefore, comparison to other biological study results can only be done on a continent-wide level, evaluating general trends in group structuring, but not on a level which would allow for significance testing.

The serogenetic population relationships identified in Excoffier, et al. (1988) are quite similar to the present dermatoglyphics results. Not only do the major group clusters (South and West Bantu, Pygmee, and Afro-asiatics) agree, they also are generally distributed in similar positions in canonical space. These comparable results infer a close relationship of dermatoglyphic population distinctions to serological traits, supporting Froelich and Giles contentions for close genetic affinities in dermatoglyphic population analysis.

In contrast to the Bantu Expansion theory however, Excoffier identifies Afro-asiatics as the primary group for dissemination through southern Africa, rather than Western Negroids. This is based on their findings of shared serological traits between Afro-asiatic and Bantu populations. Even though this hypothesis is not in agreement with Phillipson's, Hiernaux's or Greenberg's pattern of population migration in Africa, it cannot be overlooked there has been definite prehistorical influx of Asiatic stock into Africa from the Fayum region, and historically, migrations from coastal South Asia. Besides these northern "invasions", Indians were brought in by colonial Europeans to supplement the work force of blacks. The prehistorical North African gene flow advanced into southern Africa by trade networks across the Sahara and down along the Rift and eastern plains. The introduction of domesticated livestock has been associated with this

Afro-asiatic movement particularly by the Sudanic and Cushitic linguistic origins in the Bantu descriptive words for cattle and goats. The southern migrations of the Bantu-speakers comes on the heels of animal domestication in southern Africa, with the Neolithic-Iron age transition following of this technological transformation (Phillipson, 1977b). Unfortunately, dermatoglyphic relationships of Afro-asiatics cannot be evaluated in this analysis since no Sudanic or Cushitic tribes were available. The Madagascarans are Afro-asiatic in origin, but they are not a good sample to make these comparisons because of their geographical and genetic isolation from continental Africa.

The delineations of the Negroid groups and the Khoisan groups by Excoffier reflect the population distance produced by delta-g craniometric analysis by Rightmire (1970; 1976). Essentially three clusters were developed from Rightmire's analyses; the Bushmen Hottentots (Khoisan), Nama and Negroid groups. The Pygmees were included in the Negroid cluster but on a peripheral edge. Rightmire associates his results to delta-g analysis done by Hiernaux (1968) using comparative anthropometric and serological data. Hiernaux found that the relationships in his study reflected close genetic affinities of all Negroid stock in both Southern and

Western Africa, and the Pygmees allied to the Negroids genetically but not physically. The Khoisan groups were completely separate in Hiernaux's biological analysis and in the dermatoglyphic results.

In sum, the present dermatoglyphic results are concordant with population variation structures produced by craniometric, anthropometric and serologic systems. No significance tests can be performed to test the relative accuracy of these relationships, but the patterns are present and appear to be well defined. It is suggested that a more in-depth comparative analysis, such as Hiernaux's, needs to be made using raw data rather than published information, and employing the most relevant forms of statistical evaluation to interpret the overall structuring produced by and between all the various forms of biological population analysis.

Effectiveness of Different Dermatoglyphic Methods

The final task of this study was to evaluate the effectiveness of the various dermatoglyphic variables in representing African population variation. It is clear from the matrix correlation results that the use of all 20 finger ridge-counts expresses the best population differentiation with relation to expected group affiliations. Distributions are more clearly demarcated into understandable geographic and/or genetic relationships in both sexes. This is not to say the 10 finger count, finger pattern or palm ridge count methods do not also follow identifiable patterns of distribution. Each of these methods used alone would identify tribal affiliations, but their relationships would not be as straightforward as the 20 count results. Even with taking into account the fact that the removal of various groups out of a canonical structure will rearrange the group distances and variances, the reduction of matrix correlations in this analysis is greater than this effect alone. The loss of correlation indicated by the D-square distance correlation comparisons illustrates the magnitudinal reduction of usable shared information. These results strongly support Jantz's (1987) belief that the complete 20 count method is the most accurate format for presenting relevant biological population affinities through dermatoglyphics.

Populations with higher loop frequencies should not show significant information loss between 10 and 20 count methods since less quantitative information would be lost. In high whorl frequency populations, the loss of information should be quite noticeable. The differences found in the African results could then be identified as a representation of the loss of information due to the relatively high frequency of whorls on these populations. In European populations, this differential between the 10 and 20 count correlations may be low enough to permit the use of only 10 counts. But since 20 counts have a significant advantage in presenting population relationships, why not use the method which makes the best group differentiations? Jantz and Owsley (1977) have indicated that radial and ulnar sides of the fingers seem to be relatively independent, each containing some new or different information. If the smaller of the two counts (generally the radial side) were discarded, additional information which may significantly separate two populations will be overlooked. Although it does not appear to be as drastic in the African results, the trends of separation between the 20 and 10 count methods cannot be dismissed.

Independent relationship is also manifested between the finger and palm ridge-counts. Low correlation values seen in both African sexes suggest there are slightly different controls identified by these two systems. The variation found in the palms could be attributed to a number of influences different from the fingers. Differences in finger and palm volar ridged skin genesis and development may be one reason for the observed correlation comparisons. A longer period of time for environmental influences on the palmar cell structure and probable separate genetic controls may all have effects on the formation and final expression of the palmar patterns and interdigital ridge-counts. Finger ridge-counts are known to vary with regard to sex chromosomes (Barlow, 1973; Penrose, 1967) and palm patterns and ridge breadths are also known to be influenced (Barlow, 1973, Penrose and Loesch, 1967). From these findings, it has been hypothesized that the influences are due to differential sex steroid levels controlled by the sex chromosomes. This hypothesis has been strengthened by Jantz and Hunt's (1987) findings concerning finger pattern asymmetry relationships to sex chromosome aberrations. Similar palmar effects have been found in Turner's syndrome (Jantz and Brehme, 1988) and in Dyslexia (Sorenson Jamison, 1988). Since the palm ridges form later, the effects of sex chromosome controls on fetal hormones may even be greater, and may influence the formation of the palms differently between the sexes.

The female groups appear to have higher homogeneity between their means. The reasons for this pattern are not easily separated. It has been suggested that females are less plastic in their response to environmental stress, showing less variance from genetically controlled phenotypes. Thus a specific gene pool would have higher intra-group homogeneity and inter-group heterogeneity. But if the inter-group variation has constricted variation by some set of mechanisms, then group differentiation would be low. Alternatively, the female homogeneity may be a reflection of a cultural induced factor. Females have generally been more mobile across tribal bounds through trading as property or by marriage customs. Some tribes may allow females to move in and out of tribal groups more freely than males. Females are often regarded as commodities and males are needed for tribal protection and hunting. Tribal distinctions would then be a reflection of isolatory or cultural restrictions on female inter-tribal movements.

Conclusions

This investigation has identified the presence of identifiable population structures generated by dermatoglyphic variation present in the African populations used for this study. The patterning has been produced by a significant research design, so the probability of random significant generation in the data sets is very low. In addition to this test, the distance distributions produced by the dermatoglyphic data conform to geographical and cultural affinities expected to be present between the tribal groups, and are in agreement with the population structure results identified by other biological system research.

Distance correlation results indicate the dermatoglyphic variation in the African groups are highly significant to linguistic distances and marginally significant to geographic distances. The lack of strong geographic relationships is a product of much stronger genetic affinities reflected in the dermatoglyphic pattern and ridge-count clusters. There appears to be a strong biological homogeneity between the Negroid (Bantu) groups of West and South Africa, an indication of recent common ancestry between all these groups. The most distinct population in the analysis is the Bushmen, found on the extreme in most all results. The Pygmee groups tend to identify more closely to the Bushmen, but this is a product of overall dermatoglyphic size variation in the discrimination rather than biological in nature. The Pygmee groups also reflect some level of dermatoglyphic canalization in Negroid hybrid groups. The linguistic correlations are significant and support previous suggestions that dermatoglyphics closely identify cultural relationships. With new investigations concerning the evolution and relationships of Bantu linguistics, the African samples used here require further analysis using a more subdivided linguistic distance analysis to accurately evaluate the abilities of dermatoglyphics as a means for forming cultural structuring in population analysis.

The dermatoglyphic method best suited for population study appears to be the 20 finger ridge-count system. The results from this particular set of dermatoglyphic variables produced the most understandable distributions of the African samples. The 10 finger ridge-count and finger pattern frequency methods produced comparable levels of understandable results, but were approximately 20% less accurate in their abilities to differentiate groups by dermatoglyphic variation. The palmar interdigital ridge-counts produced patterns of population distribution which followed the general trend seen in the finger data results. But they also contained variation which was significantly different. This new information may be as important as that contained in the fingers, but it does not seem to be viable for population delineation in geographical or cultural terms. It appears palmar dermatoglyphics reflect variation due to additional environmental and hormonal factors not found in finger dermatoglyphics. Palmar pattern frequencies do not show any relevant population affinities to the African data sets.

Continued investigation needs to be made into African population dermatoglyphic variation, pursuing the aspects of the Bantu expansion hypothesis. With the use of more sophisticated statistical methods and new linguistic classification systems, the biological relationships of African populations may be interpreted and the patterns of population dissemination through Africa identified. With the findings presented in this analysis, it is evident that dermatoglyphics are an important tool to be employed in this endeavor.

REFERENCES CITED

Aschner, B. and M. Weninger (1967) Ein Beitrag zur Frage der Arteriosklerose bei Negren Anthropologie Anz. 30:120-127.

Austin, D.M., Ghesquiere and M. Azama (1979) Work capacity and body morphology of Bantu and Pygmoid groups of Western Zaire. Human Biology 51:79-89.

Babler, W.J. (1978) Prenatal selection and dermatoglyphic patterns. American Journal of Physical Anthropology 48:21-27.

Babler, W.J. (1979) Quantitative differences in morphogenesis of human epidermal ridges. In, Dermatoglypics-Fifty Years Later. ed. by Wertelecki, W and C. Plato, Birth Defects Original Articles Series 15, New York:Alan R. Liss, pp.199-208.

Baitsch, H. and F. Schwarzfischer (1959) Zur Biometre und geographischen Verteilung der Leistenzahlen in den Interdigitalfeldern der Handfläche. Homo 10:226-236.

Barlow, P. (1973) The influence of inactive chromosomes on human development. Humangenetik 17:105-136.

Bascom, W. (1969) The Yoruba of Southwestern Nigeria. New York:Holt, Reinhart and Winston.

Bastin, Y., Coupez, A. and B. de Halleux (1979) Statistiques lexicales et grammaticales pour la classification historique des langues bantoues. Bulletin de l'Academie Royale des Sciences d'Outre-Mer 23:375-387.

Bastin, Y., Coupez, A. and B. de Halleux (1983) Classification lexicostatistiques des langues bantoues (214 releves). Bulletin de l'Academie Royale des Sciences d'Outre-Mer 27:173-199.

Becquet, R., Gasteau, T. and C. Happi (1959) Reséarches sur la drépanocytose en pays Bamiléké (Cameroun). Bulletins et Mémoires de la Société d'Anthropologie 10:273-283.

Bedaux, R.M.A. (1980) The geographic distribution of footed bowls in the Upper and Middle Niger region. In, West African Culture Dynamics: Archaeological and Historical Perspectives. ed. by B.K. Swartz and R.E. Dumett, New York:Mouton Publishers. pp. 247-258.

Beech, M. H. (1911) The Suk. Their Language and Folklore. Oxford:Clarendon Press.

Bender, K., Frank, R. and H.W. Hitzeroth (1977) Glyoxalase I polymorphism in South African Bantu-speaking Negroids. Human Genetics 38:223-226.

Binkley, K.M. (1985) A search for systematic variability in inter-finger ridge count variation among European groups. Ph.D. dissertation, University of Tennessee, Knoxville.

Brehme, H. (1972a) Über das Hautleistensystem von Bieno- und Luimbe-Bantus (Zentral-Angola); zugleich erstmalige Mitteilung von Zehenmusterbefunden Negrider. Zeischrift für Morphologie und Anthropologie 64:159-185.

Brehme, H. (1972b) Über das Hautleistensystem der Angolanischen Quioco- und Ginga-Bantus. Zeischrift für Morphologie und Anthropologie 64:362-385.

Brehme, H., and H.W. Hitzeroth (1979) Hautleistenbefunde bei bantusprechenden, nigriden Populationen der Republik Südafrika. Teil 1. Fingerbeeren und Handflächen. Zeitschrift für Morphologie und Anthropologie 70:195-217.

Brehme, H., and H.W. Hitzeroth (1980) Hautleistenbefunde bei bantusprechenden, negriden Populationen der Republik Südafrika. Teil 2. Zehenbeeren und FuBsohlen Zeitschrift für Morphologie und Anthropologie 70:310-322.

Brodhage, G., and Wendt, G. G. (1951) Eine notwendige Ergänzung der quantitatinen erbbiolgischen Auswertlung von Fingerleisten. Zeitschrift für menschlisten Vererbungs-und Konstitutionslehre 30:212-220.

Brothwell, D.R. (1963) Evidence of early population change in central and southern Africa: doubts and problems. Man 63:101-4.

Brues, A. M. (1977) People and Races. New York:MacMillian Publishing.

Burssens, H. (1958) Les Peuplades de L'Entre Congo-Ubangi. Vol.4 of Sciences de l'Hommes, Monogaphies Ethnographiques, Annales du Musée Royal du Congo Belge, Tervuren, Belgique.

Cardoso, C.L. (1967) "Ovatjimba" in Angola. Museu regional de ceramica. Cadern. Etnogr. 2:1

Cavalli-Sforza, L.L. (1986a) African Pygmees New York: Academic Press.

Cavalli-Sforza, L.L. (1986b) African Pygmees: An Evaluation of the State of Research. In, African Pygmees, ed. by L.L. Cavalli-Sforza, New York:Academic Press, pp. 361-426.

Cerasi, E. and R. Luft (1963) Plasma insulin response to sustained hyperglycemia induced by glucose infusion in human subjects. Lancet 2:1359-1361.

Chamla M-C. (1957) Les Empreintes digitales et palmaires des Malgaches. Bulletins et Mémoires de la Société de Paris 8:383-404.

Cheek, D.B. (1968) Muscle cell growth in abnormal children. In, Human Growth ed. by D.B. Cheek, Philadelphia:Lea and Fabiger, pp. 352-377.

Cummins, H. (1955) Dermatoglyphics of Bushmen (South Africa). American Journal of Physical Anthropology 13:699-710.

Cummins, H. and C. Midlo (1926) Palmar and plantar epidermal ridge configurations (dermatoglyphics) in European-Americans American Journal of Physical Anthropology 9:471-502.

Cummins, H., and Midlo, C. (1961) FingerPrints, Palms and Soles. New York:Dover.

Dankmeijer, H. (1938) Some anthropological data on finger prints. American Journal of Physical Anthropology 23:377-388.

Dankmeijer, H. (1947) Finger prints of African Pygmies and Negroes. American Journal of Physical Anthropology 5:453-484.

David, N. (1980) History of crops and peoples in North Cameroon to A.D. 1900. In, West African Culture Dynamics: Archaeological and Historical Perspectives. ed by B.K. Swartz and R.E. Dumett. New York:Mouton Publishers. pp. 139-182.

De Villiers, H. (1972) Digital dermatoglyphics of southern African Negro populations. Preliminary report on pattern type and total ridge count. South African Journal of Science August.

Dow, M.M. and J.M. Cheverud (1985) Comparison of distance matrices in studies of population structure and genetic microdifferentiation: Quadratic assignment. American Jounal of Physical Anthropology 68:367-274.

Dow, M.M., Cheverud, J.M. and J.S. Friedlaender (1987) Partial correlation of distance matrices in studies of population structure. American Journal of Physical Anthropology 72:343-352.

Dow, M.M., Cheverud, J.M. Rhoads, J. and J.S. Friedaender (1986) Statistical comparisons of biological and cultural historical variation. In The Solomon Islands Project: Health, Human Biology and Culture Change. ed. by J. Friedlaender. New York:Oxford University Press, pp. 265-281.

Dugast, E. (1949) Inventaire ethnique du Sud-Cameroun. Mémoires de l'Institute Français d'Africque Noire, Centre du Cameroun.

Dumett, R.E. (1980) Introduction: Research trends in West African history. In, West African Culture Dynamics: Archaeological and Historical Perpectives, ed. by B.K. Swartz and R.E. Dumett, New York:Mouton Publishers. pp. 279-303.

Excoffier, L., Pellegrini, B., Sanchez-Mazas, A., Simon, C. and A. Langaney (1988) Genetics and history of Sub-Saharan Africa. Yearbook of Physical Anthropology 30:151-194.

Fagan, B.H. (1965) Radiocarbon dates for Sub-Saharan Africa-III. Journal of African History 6:107-116.

Fagan, B.H. (1966) Radiocarbon dates for Sub-Saharan Africa-IV. Journal of African History 7:495-506.

Fagan, B.H. (1967) Radiocarbon dates for Sub-Saharan Africa-V. Journal of African History 8:513-527.

Fraser, G.R., Gilbett, E.R. and G. Motulsky (1966) Population genetics studies in the Congo. III. Blood groups (ABO, MNSs, Rh, Jsa). American Journal of Human Genetics 18:546-552.

Friedlaender, J.S. (1975) Patterns of Human Variation Cambridge:Harvard University Press.

Froehlich, J.W. and E. Giles (1981a) A multivariate approach to fingerprint variation in Papua New Guinea:implications for prehistory. American Journal of Physical Anthropology 54:73-91.

Froehlich, J.W. and E. Giles (1981b) A multivariate approach to fingerprint variation in Papua New Guinea; perspectives on evolutionary stability of dermatoglyphic markers. American Journal of Physical Anthropology 54:93-106.

Galton, F. (1892) Finger Prints London, Macmillan and Co.

Garlick, J. P., and Barnicot, N. A. (1957) Blood groups and haemoglobin varients in Nigerian (Yoruba) schoolchildren. Annals of Human Genetics, 21:420-425.

Gauthier, J. (1969) Les Fali. Montagnards du Nord Cameroun. Oosterhout/Netherlands:International Booksellers.

Gauthier, J. and J. Wangermez (1964) Caractères et variations morphologiques des Fali du Tinguelin, Nord-Cameroun. Bulletins et Mémoires de la Société d'Anthropologie de Paris 6:585-610.

Geipel, G. (1935) Anleitung zur erbbiologischen Beureilung der Finger- und Handleisten. München:J. F. Lehmanns.

Geipel, G. (1948) Die palmeren Hautleisten: Hinweise auf die Rasseneinordnung der Afrikischen Bambutiden. In Gusinde, M. Urivaldmenschen am Ituri. Springer, Vienna.

Geipel, G. (1956) Die Finger- und Handleisten bei Bambuti und Buschmännern. Homo 7-8:74-86.

Geipel, G. (1957) Die Finger- und Handleisten der Neger Madagaskars, zugleich ein Beitrag zur Frage ihres Ursprungs. Zeitschrift für Morphologie und Anthropologie 48:234-253.

Geipel, G. (1958) Die Tastleisten der Fußsohlen von Negrn Madagaskars, Afrikas und Arabern Nordafrikas. Zeitchrift für Morphologie und Anthropologie 49:232-239.

Geipel, G. (1964) Fingerleisten und Handfurchen bei den afrikanischen Mangbetu-Negern. Zeitschrift für Morphologie und Anthropologie 55:235-241.

Gessain, M. (1957) Les dermatoglyphes digitaux des Noirs d'Afrique. L'Anthropologie 61:239-267.

Glanville, E.V. (1967) Dermatoglyphics of the fingers and palms of the Kurumba from Upper Volta. Verhandlingen Koninklijke Nederlandse Akademie van Wetenschappen te Amsterdam 70:535-542.

Glanville, E.V. (1968) Digital and palmar dermatoglyphics of the Fali and Bamaleke of Cameroons. Verhandlingen Koninklijke Nederlandse Akademie van Wetenschappen te Amsterdam 71:529-536.

Glanville, E.V. (1969) Digital ridge-counts of Efe Pygmies. American Journal of Physical Anthropology 31:427-428.

Glanville, E.V. and J. Huizinga (1966a) Palmar dermatoglyphics of the Dogon and Peul of Mali. Verhandlingen Koninklijke Nederlandse Akademie van Wetenschappen te Amsterdam 69:528-539.

Glanville, E.V. and J. Huizinga (1966b) Digital dermatoglyphics of the Dogon, Peul and Kurumba of Mali and Upper Volta. Verhandlingen Koninklijke Nederlandse Akademie van Wetenschappen te Amsterdam 69:664-674.

Gower, J.C. (1972) Measures of taxonomic distance and their analysis. In The Assessment of Population Affinities in Man, ed. by Weiner, J.S. and J. Huizinga, New York:Oxford University Press, pp. 1-24.

Greenberg, J. H. (1966) The Languages of Africa. Bloomington:Indiana University Press.

Greenberg, J.H. (1972) Linguistic evidence regarding Bantu origins. Journal of African History 13:189-216.

Griaule, M. (1938) Masques Dogons. Institut d'Ethnologie, Paris.

Gusinde, M. (1953) Anthropological investigations of the Bushmen of South Africa. Anthropological Quarterly 26:20-28.

Gutherie, M. (1948) _The Classification of the Bantu Language_, London:Oxford University Press.

Gutherie, M. (1962) Some developments in the pre-history of the Bantu languages. _Journal of African History,_ 3:273-282.

Happi, C. (1959) Researches hématologiques chez les Bamileke (Cameroon). (Paris:Thèse de Doctorat en Médecine). Referenced in, _The People of Africa_, by J. Hiernaux, 1975, New York:Charles Scribner's Sons.

Heine, B. (1973) Zur genetischen Gliederung der Bantu-sprachen. _Afrika und Übersee_ 56:164-185.

Henninot, M.M. E., Polaert, J. and C. Happi (1958) Résearches sur les groupes sanguins de populations Bamiléké (Bafang, Cameroun). _Bulletins et Mémoires de la Société de Paris_ 9:340-351.

Hiernaux, J. (1962) Données génétiques sur six populations de la République du Congo (groupes sanguin ABO et Rh, et taux de sicklemie). _Annales de la Société Belge Médiciene Tropicale_ 2:145-174.

Hiernaux, J. (1966) Les Bushong et Cwa du Royaume Kuba (Congo-Kinshasa): Pygmées, Pygmoïdes et Pygméisation; anthropologie, linguistique et expansion Bantoue. _Bulletins et Mémoires de la Société d'Anthropologie de Paris_ 11:299-336.

Hiernaux, J. (1968) Bantu expansion: the evidence from physical anthropology confronted with linguistic and archeological evidence. _Journal of African History_ 9:505-515.

Hiernaux, J. (1975) _The People of Africa._ New York:Charles Scribner's Sons.

Hiernaux, J., and Fromet, A. (1976) The correlations between anthropological and climatic variables in sub-Saharan Africa: revised estimates. _Human Biology,_ 48:757-767.

Hitzeroth, H.W. (1976a) On the identity of the stone-working Tjimba of south west Africa. A comparative multivariate anthropometric analysis. _Cimbebasia_ 2:209-226.

Hitzeroth, H.W. (1976b) On the identity of the stone-working Tjimba of south west Africa. A comparative study based on fingerprint pattern frequencies. Cimbebasia 2:187-202.

Hitzeroth, H.W. (1986) On the genetic interrelationships of South African Negroes. American Journal of Physical Anthropology 69:389-401.

Hitzeroth, H.W. and K. Bender (1980) Erythrocyte G-6-PD and 6-PGD genetic polymorphisms in South African Negroes, with a note on G-6-PD and the Malaria Hypothesis. Human Genetics 54:233-242.

Hitzeroth, H.W., Bender, K. and R. Frank (1981) South African Negroes: Isoenzyme polymorphisms (GPT, PGM1, PGM2, AcP, AK and ADA) and tentative genetic distances. Anthropologie Anz. 39:20-35.

Hitzeroth, H.W., Bender, K. and J.M. Wolfswinkel (1976) Esterase D polymorphism in South African Negroids. South African Journal of Science 72:301-303.

Hitzeroth, H.W., Brehme, H., and R.L. Jantz (1986) Dermatoglyphic findings of a Coloured sample from the Transvaal, Republic of South Africa. Zeitschrift für Morphologie und Anthropologie 76:219-238.

Hitzeroth, H.W. and K. Hummel (1978) Serum protein polymorphisms Hp, Tf, Gc, Gm, Inv and Pt in Bantu speaking South African Negroids. Anthrop. Anz. 36:127-141.

Holt, S.B. (1961) Palm-prints and their uses in medical biology. Cerebral Palsy Bulletin 3:333-347.

Holt, S.B. (1968) The Genetics of Dermal Ridges. Springfield, Illinois:Charles C. Thomas.

Hrezcko, T.A. and D. F. Roberts (1985) Palmar pattern reduction among the Bushmen. Annals of Human Genetics 12:213-223.

Huizinga, J. (1965) Finger patterns and ridge counts of the Dogons. Verhandlingen Koninklijke Nederlandse Akademie van Wetenschappen te Amsterdam 68:398-411.

Huizinga, J (1968a) Human biological observations on some African populations of the thorn savanna belt. I & II. Verhandlingen Koninklijke Nederlandse Akademie van Wetenschappen te Amsterdam 71:356-372 & 373-390.

Huizinga, J. (1968b) New Physical anthropological evidence bearing on the relationships between Dogon, Kurumba, and the extinct African Tellem populations. Verhandlingen Koninklijke Nederlandse Akademie van Wetenschappen te Amsterdam 71:16-30.

Huizinga, J. and N.F. Birnie-Tellier (1966) Some anthropometric data on male and female Dogons. I & II. (The 'harmoniously reduced male') Verhandelingen Koninklijke Nederlandse Akadamie van Wetenschappen te Amsterdam 69:675-688 & 689-695.

Huizinga, J. and N.F. Birnie-Tellier (1967) Blood pressure in the Kurumba from Upper Volta. Verhandelingen Koninklijke Nederlandse Akademie van Wetenschappen te Amsterdam 70:242-249.

Huizinga, J. and V. Glanville (1968) Vital capacity and timed vital capacity in the Kurumba from Upper Volta. South African Journal of Science 64:125-133.

Huizinga, J. and B. Reijnders (1974a) Heart rate changes during exercise (step test) among the Fali of North Cameroon. Verhandlingen Koninklijke Nederlandse Akademie van Wetenschappen te Amsterdam 77:283-294.

Huizinga, J. and B. Reijnders (1974b) Skinfold thickness and body fat in adult male and female Fali (North Cameroon). Verhandlingen Koninklijke Nederlandse Akademie van Wetenschappen te Amsterdam 77:496-503.

Hrezcko, T.A. and D.F. Roberts (1985) Palmar reduction among the Bushmen. Annals of Human Biology 12:213-223.

Ignazi, G. (1966) Réflectométrie cutanée d'enfants Mélano-Africains et Européens. Bulletins et Mémoires de la Société d'Anthropologie de Paris 9:123-135.

Jadin, J. (1935) Les groupes sanguins des Pygmées.Mémoires de Institute royale Colon. Belge, Séction del la Sciences du National Médicene 4:1-26.

Jadin, J. (1963) Les groupes sanguins et la repartition de la siçlemie dans les populations congolaises. Annales de la Société Belge du Médiciene Tropicales 43:437-484.

Jantz, R.L. (1977) Sex and race differences in finger ridge-count correlations. American Journal of Physical Anthropology 46:171-176.

Jantz, R.L. (1979) On the levels of dermatoglyphic variation. In, Dermatoglyphics-Fifty Years Later. ed. by Wertelecki, W and C. Plato, Birth Defects Original Articles Series 15, New York:Alan R. Liss, pp.199-208.

Jantz, R.L. (1987) Anthropological dermatoglyphic research. Annual Review of Anthropology 16:161-177.

Jantz, R.L. and H. Brehme (1978) Finger and palmar dermatoglyphics of a Yoruba (Nigeria) sample. Annals of Human Biology 5:539-546.

Jantz, R.L. and H. Brehme (1988) Palmar interdigital ridge-counts in 45,X Turner syndrome. Human Biology 60:453-460.

Jantz, R.L., Brehme, H. and K. Bender (1984) Genetic and environmental variation of ridge-counts on fingers, palms, soles and toes: A twin study. Acta Geneticae Medicae et Gemellologiae 33:531-546.

Jantz, R.L. Brehme, H. and D.R. Hunt (1987) Covariation among palmar interdigital ridge-counts. American Journal of Physical Anthropology 72:216.

Jantz R.L. and V.P. Chopra (1983) A comparison of dermatoglyphic methodologies in population studies. American Journal of Physical Anthropology 60:61-67.

Jantz, R.L., Fohl, F.K. and J.W. Zahler (1979) Finger ridge-counts and handedness. Human Biology 51:91-99.

Jantz, R. L. and C.H. Hawkinson (1979) Finger ridge-count variability in Sub-Saharan Africa. Annal of Human Biology, 6:41-53.

Jantz, R.L. and C.H. Hawkinson (1980) Components of racial variation in finger ridge-counts. American Journal of Physical Anthropology 52:139-144.

Jantz, R.L., Hawkinson, C.H., Brehme, H., and H.W. Hitzeroth (1982) Finger ridge-count variation among various Subsaharan African Groups. American Journal of Physical Anthropology 57:311-321.

Jantz, R.L. and D.R. Hunt (1987) The influence of sex chromosomes on finger dermatoglyphic patterns. Annals of Human Biology 13:287-295.

Jantz, R.L. and D.W. Owsley (1977) Factor analysis of finger ridge-counts in Blacks and Whites. Annals of Human Biology 4:357-366.

Jantz, R.L. and K.R. Parham (1978) Racial differences in dermal ridge breadth. Human Biology 50:33-40.

Jantz, R.L. and R.S. Webb (1982) Interpopulation variation in fluctuating asymmetry of the palmar A-B ridge-count. American Journal of Physical Anthropology 57:253-259.

Jenkins, T. (1966) Ability to taste phenylthiocarbamide in Kalahari Bushmen and Southern Bantu. Human Biology

Jenkins, T. and A.G. Steinberg (1966) Some serum protein polymorphisms in Kalahari Bushmen and Bantu: Gamma Globulins, Haptoglobins and Transferrins. American Journal of Human Genetics 18:399-407.

Jenkins, T., Zoutendyk, A., and Steinberg, A. G. (1970) Gammaglobulin groups (Gm and Inv) of various South African populations. American Journal of Physical Anthropology, 32:197-218.

Kent, R.K. (1968a) Madagascar and Africa. I. The problem of the Bara. Journal of African History 9:387-408.

Kent, R.K. (1968b) Madagascar and Africa: II. The Sakalava, Maroserana, Dady and Tromba before 1700. Journal of African History 9:517-546.

Knussmann R. and F.W. Rösing (1974) Die Ähnlichkeitsverhältnisse im südwestlichen Afrika nach anthropometrischen Merkmalen. Bevölkerungsbiologie S. 125-153.

Lebeuf, J-P. (1961) L'habitation des Fali montagnards du Cameroun septentrional. Libraire Hachette, Paris.

Leschi, J. (1948) Empreintes digitales chez quelques peuples d'Afrique Occidentale Française. Bulletin de la Mémoire de la Société Anthropologie de Paris 9:143-150.

Leschi, J. (1958) Premières données craniométriques concernant des Noirs Dogon, de la boucle du Niger (soudan Français). Variations des indices craniens. Bulletins et Mémoires de la Société de Paris 9:160-195.

Leschi, J. (1959) Quelques mesures concernant la tête osseuse de Noirs Dogon de la boucle du Niger (falaises de Baniagara). Bulletins et Mémoires de la Société de Paris 10:186-195.

Lestrange, M. De (1953) Les crêtes papillaires digitales de 1.491 Noirs d'Afrique occidentale. Bulletin de l'Institut français d'Afrique noire, 15:1278-1315.

Linton, R. (1933) The Tanala, a hill tribe of Madagascar. Field Museum of Natural History Series of Anthropology no. 22.

Livingstone, F.B. (1969) Gene frequency clines of the Beta hemoglobin locus in various human populations and their simulation by models involving differential selection. Human Biology 41:223-236.

Livingstone, F.B. (1976) Hemoglobin history in West Africa. Human Biology 48:487-500.

Lloyd, P.C. (1965) The Yoruba of Nigeria. In, Peoples of Africa, ed. by J.L. Gibbs, Jr., New York:Holt Reinhart and Winston. pp. 547-582.

Loesch, D. (1974) Genetical studies of sole and palmar dermatoglyphics Annals of Human Genetics 37:405-420.

Mann, G.V., Roels, A., Price, D.L. and J.M. Merrill (1962) Cardiovascular disease in African Pygmies. A survey of the health status, serum lipids, and diet of Pygmies in the Congo. Journal of Chronic Diseases 15:341-371.

Matznetter, T. (1967) Untersuchungen über das Papillarsystem südwestangolanischer Negerstämme. Mitteilungen Anthropologische geschlschaft Wein 96/97:21-56.

Mauff, G., Gauchel, F.D. and H.W. Hitzeroth (1976) Polymorphism of Properdin Factor B in South African Negroid, Indian and Coloured populations. Human Genetics 33:319-322.

Mears, J.G., Boldjord, C., Benabadji, M.,Belghiti, Y.A., Baddou, M.A., Labie, D. and R.L. Nagel (1981a) The sickle cell gene polymorphism in North Africa. Blood 58:599-601.

Mears, J.G., Lachman, H.M., Cabanneas, R., Anegnizin, K.P.E., Labie, D. and R.L. Nagel (1981b) Sickle gene: Its origin and diffusion from West Africa. Journal of Clinical Investigation 68:606-610.

Merimee, T.J. and D.L. Rimoin (1986) Growth hormone and insulin-like growth factors in the Western Pygmy. In, African Pygmies, ed. by L.L. Cavalli-Sforza, New York:Academic Press, pp. 167-177.

Merimee, T.J., Rimoin, D.L. and L.L. Cavalli-Sforza (1972) Metabolic studies in the African Pygmy. Journal of Clinical Investigation 15:395-401.

Merimee, T.J., Zaph, J. and E.R. Froesch (1981) Dwarfism in the Pygmy. An isolated deficiency of insulin-like growth factor I. New England Journal of Medicine 305:965-968.

Mouser, B. L. (1980) Accommodation and assimilation in the Lanlord-Stranger relationship. In, West African Culture Dynamics: Archaeological and Historical Perspectives ed. by B. K. Swartz, Jr. and R.E. Dumett, New York:Mouton Publishers. pp. 495-514.

Murdock, G.P. (1959) Africa, Its People and Their Culture History New York:McGraw Hill.

Nurse, G.T., Bodmer, J.G., Bodmer, W.F., Van Leeuwen, A., Van Rood, J.J., du Toit, E.D. and M.C. Botha (1975) A reassessment of the HL-A system in Khoisan populations of South West Africa. Tissue Antigens 5:402-414.

Nurse, G.T., Botha, M.C. and T. Jenkins (1977) Sero-genetic studies of the San of South West Africa. Human Genetics 27:81-98.

Nurse, G.T. and T. Jenkins (1977) Serogenetic studies of the Kavango peoples of South West Africa. Annals of Human Biology 4:465-478.

Nurse, G.T., Jenkins, T., Santos, D. and J.H. & A.G. Steinberg (1979) The Njinga of Angola: A serogenetic study. Annals of Human Biology 6:337-348.

Olivier, G. (1947a) Études des groupes sanguins chez les Noirs du Cameroun. L'Anthropologie 51:445-460.

Olivier, G. (1947b) Contributions l'étude anthropologique du Sud-Cameroun. Bulletin de la Mémoires du Société d'Anthropologie 8:68-75.

Oliver, R. (1966) The problem of the Bantu expansion. Journal of African History 7:361-376.

Oliver, R. and B.M. Fagan (1975) Africa in the Iron Age Cambridge:Cambridge University Press.

Ojikutu, R.O., Nurse, G.T. and T. Jenkins (1977) Red cell enzyme polymorphisms in the Yoruba. Human Heredity 27:444-453.

Penrose, L.S. (1967) Fingerprint patterns and sex chromosomes. Lancet 1:298-300.

Penrose, L.S. and D. Loesch (1967) A study of dermal ridge-width in the second (palmar) interdigital area with special reference to aneuploid states. Journal of Mental Deficiency Research 11:36-42.

Penrose, L.S. and D. Loesch (1970) Topological classification of palmar dermatoglyphics. Journal of Medical Deficiency Research 14:111-128.

Perinbam, B.M. (1980) The Julas in Western Sudanese history: long distance traders and developers of resources. In, West African Culture Dynamics: Archaeological and Historical Perpectives. ed. by B.K. Swartz and R.E. Dumett, New York:Mouton Publishers. pp. 455-475.

Phillipson, D.W. (1970) Notes on the later prehistoric radiocarbon chronology of eastern and southern Africa. Journal of African History 11:1-15.

Phillipson, D.W. (1975) The chronology of the Iron Age in Bantu Africa. Journal of African History 16:321-342.

Phillipson, D. W. (1977a) The spread of the Bantu language. Scientific American, 236:106-114.

Phillipson, D.W. (1977b) The Later Prehistory of Eastern and Southern Africa New York:Africana Publishing.

Posnansky, M. (1961) Pottery types from archaeological sites in East Africa. Journal of African History 2:193-208.

Posnansky, M. (1968) Bantu genesis-archeological reflexions. Journal of African History 9:I-II.

Poutrin, Le D. (1910) Contribution a l'étude des Pygmées d'Afrique. Les Négrilles du Centre Africain (type brachycéphale). L'Anthropologie 21:435-504.

Poutrin, Le. D. (1911) Contribution a l'étude des Pygmées d'Afrique. Les Négrilles du Centre Africain (type sous-Dolichocéphale). L'Anthropologie 22:421-549.

Poutrin, Le D. (1912) Contribution a l'étude des Pygmées d'Afrique. Les Négrilles du Centre Africain (type sous-dolichocéphale). L'Anthropologie 23:349-415.

Reys, L., Manso, C. and G. Stamatoyannopoulos (1970) Genetic studies on Southeastern Bantu of Mozambique. I. Varients of Glucose-6-Phospate Dehydrogenese. American Journal of Human Genetics 22:203-215.

Rife, D.C. (1953) Finger prints as criteria of ethnic relationship. American Journal of Human Genetics 5:389-399.

Rightmire, G.P. (1970) Bushman, Hottentot and South African Negro Crania studied by distance and discrimination. American Journal of Physical Anthropology 33:169-196.

Rightmire, G. P. (1976) Metric versus discrete traits in African skulls. In The Measures of Man. eds., E. Giles and J. S. Frielaender, Cambridge:Peabody Museum Press, pp. 383-407.

Rigters-Aris, C.A. (1973) Réflectometrie cutanée des Fali (Cameroon). Koniklijke Nederlandse Akademie van Wetenschappen te Amsterdam 76:500-511.

Rigters-Aris, C.A. (1975a) Dermatoglyphics of three west African tribes (Fali-Cameroon, Kusasi-Ghana, Baoule-Ivory Coast). I. Digital patterns. Verhandlingen Koninklijke Nederlandse Akadamie van Wetenschappen te Amsterdam 78:47-57.

Rigters-Aris, C.A. (1975b) Dermatoglyphics of three west African tribes (Fali-Cameroon, Kusasi-Ghana, Baoule-Ivory Coast). II. Palmar dermatoglyphics Verhandlingen Koninklijke Nederlandse Akademie van Wetenschappen te Amsterdam 78:298-309.

Rimoin, D.L., Merimee, T.L. and L.L. Cavalli-Sforza (1971) Growth hormone unresponsiveness in the African Pygmies. Proceedings of the International Congress of Humans Genetics, Paris, 4:152.

Roberts, D.F., Chavez, J. and A. Redmayne (1974) Dermatoglyphics of the Hehe (Tanzania). Man 9:31-43.

Rosa, P.J. (1983) Descriptive Report on a Dermatoglyphic Survey of 6235 Schoolchildren from Kenya. United Kingdom: University of Durham, Department of Anthropology.

Rösing, F. W. (1977) Anthropometry of six tribal populations in Angola. Zeitschrift für Morphologie und Anthropologie, 68:107-122.

Rudan, P., Simic, D. and L.A. Bennett (1988) Isolation by distance on the island of Korcula: Correlation analysis of distance measures. American Journal of Physical Anthropology 77:97-103.

Schebasta, P. (1938) Die Bambuti-Pygmäen vom Ituri. Vol.1. Geschichte, Geographie. Umwelt, Demographie und Anthropologie der Ituri-Bambuti. Mémoires de la Institut du Royal Colonial Belge, Brussels.

Schreider, E. (1963) Physiological anthropology and climatic variations. Proceedings of the Lucknow Symposium "Environmental Physiology and Psychology in arid conditions". UNESCO, Paris, 37-73.

Singer, R., Budtz-Olsen, O.E. and P. Brain (1957) Physical features, sickling and serology of the Malagasy of Madagascar. American Journal of Physical Anthropology 15:91-124.

Singh, S. (1979) Evidence of dominance in the finger ridge-counts using multivariate analysis. In, Dermatoglyphics-Fifty Years Later. ed. by Wertelecki, W. and C. Plato, Birth Defects Original Articles Series 15, New York: Alan R. Liss, pp.495-500.

Sokal, R.R (1988) Genetic, geographic, and linguistic distances in Europe. Proceedings of the National Academy of Sciences 85:1722-1726.

Sokal, R.R., Oden, N.L. and B.A. Thompson (1988) Genetic changes across language boundries in Europe. American Journal of Physical Anthropology, 76:337-361.

Sorenson Jamison, C. (1988) Palmar dermatoglyphics of dyslexia. American Journal of Physical Anthropology 76:505-513.

Spence, M.A., Westlake, J. and K. Lange (1977) Estimation of the variance components for dermal ridge count. Annals of Human Genetics 41:111-115.

Spielmann, V.W., Teixidor, D. and T. Matznetter (1973) Blutgruppen bei Bantu-Populations aus Angola zugleich ein Beitrag zur Berechnung der Vaterschafts-wahrscheinlichkeit bei Gutachten mit Negern als Eventualvätern. Blut 27:322-335.

Spuhler, J.N. (1972) Genetic, linguistic, and geographical distances in native North America. In The Assessment of Population Affinities in Man ed. by Weiner, J.S. and J. Huizinga, New York:Oxford University Press, pp. 72-95.

Stenning, D.J. (1965) Pastoral Fulani of North Nigeria. In, Peoples of Africa, ed. by J.L. Gibbs, Jr., New York:Holt, Reinhart and Winston. pp. 361-402.

Sunderland, E. and E. Coope (1973) The tribes of South and Central Ghana: A dermatoglyphic investigation. Man 8:228-265.

Talbot, P. A., and Mulhall, H. (1962) The Physical Anthropology of Southern Nigeria. Cambridge:Cambridge University Press.

Tardits, C. (1960) Contribution a l'Étude des populations Bamiléké de l'Ouest Cameroun. No. 4 in l'Homme d'Outre-Mer, Conseil superieur des Recherches sociologiques outre-mer. Paris:Editions Berger-Levrault.

Tillner, I. (1967) Hautleistenbefunde der Fingerbeeren bei den Baga, einem westafrikanischen Negerstámm. Zeitschrift für Morphologie und Anthropologie 30:97-119.

Tobias, P.V., Soussi, J. and H.L.A. de Villiers (1961) Fingerprints and palmar prints of Kalahari Bushmen. South African Journal of Science 67:333-345.

Turnbull, C. M. (1965a) The Mbuti Pygmies: An ethnographic survey. Anthropological Papers of the American Museum of Natural History 50:139-282.

Turnbull, C. M. (1965b) Wayward Servants. The two Worlds of the African Pygmies. Garden City, New York:Natural History Press.

van de Koppel, J.M.H. and B.S. Hewlett (1986) Growth of Aka Pygmies and Bagandus of the Central African Republic. In, African Pygmies, ed. by L.L. Cavalli-Sforza, New York:Academic Press, pp. 95-102.

Vansina, J. (1984) Western Bantu expansion. Journal of African History 25:129-145.

Vrydagh-Laoureux, S. (1977) Dermatoglyphes de noirs de la région de Libenge (Zaire). Bulletin de la Société royal belge Anthropologie Préhistoire 88:125-143.

Vrydagh-Laoureux, S. (1979) Dermatoglyphes palmaires de Noirs de la région de Libenge (Zaire). Bulletin de la Société royal belge Anthropologie Préhistoire 90:179-195.

Wangermez, J. and M. Lamontellerie (1974) Les dermatoglyphes des Karaboro (Haute-Volta) fréquence comparée des tourbillons en Afrique tropicale. Bulletin de Mémoire de la Société d'Anthropologie de Paris 8:357-371.

Weiskel, T.C. (1980) Changing perspectives on African resistance movements and the case of the Baule Peoples. In, West African Culture Dynamics: Archaeological and Historical Perspectives, ed. by B.K. Swartz and R.E. Dumett, New York:Mouton Publishers, pp. 545-561.

Weninger, M. and V. Schieber (1974) Morphologische Untersuchungen der äuBeren Nase von west- und ostafrikanischen Bantunegern. Zeitschrift für Morphologie und Anthropologie 66:51-82.

Weninger, M. and V. Schieber (1975) Anthropologisch-metrische Untersuchungen an west- und ostafriknischen Bantunegern. _Zeitschrift für Morphologie und Anthropologie_ 67:60-84.

Westermann, D. (1927) Die westlichen Sudansprachen und ihre Beziehungen zum Bantu. _Mittheilungen des Seminars für orientalische Sprachen_, Vol. 30.

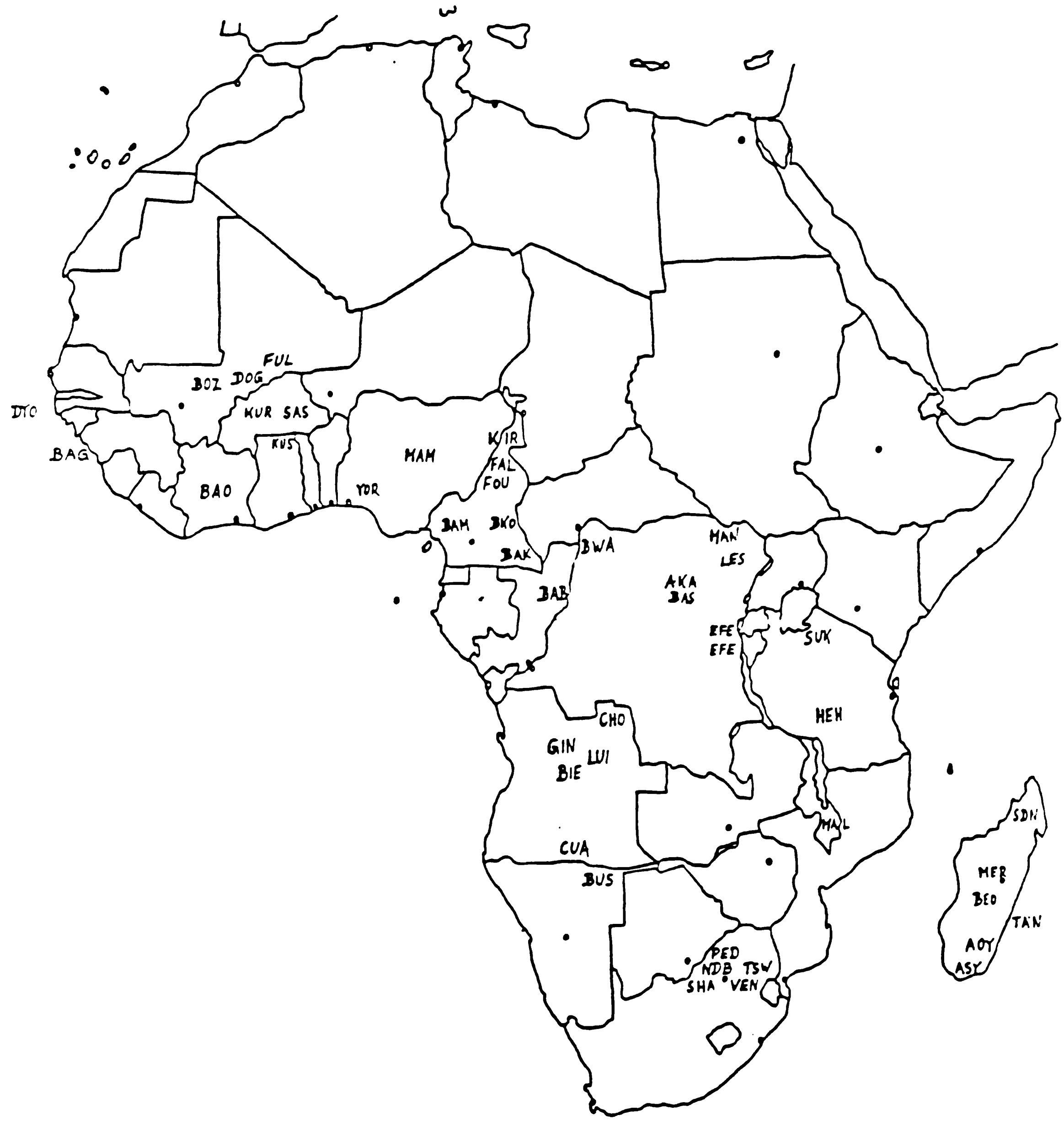
Westermann, D. (1935) Nominalklassen in westafrikanischen Klassensprachen und in Bantusprachen. _Mittheilungen des Seminars für orientalische Sprachen_ 38/3:1-55.

Wilder, H. H. (1902) Palms and Soles. _American Journal of Anatomy_ 1:423-441.

APPENDICES

APPENDIX A

LIST OF SAMPLES AND GEOGRAPHICAL PLACEMENT



Geographic Distribution of Samples Used.

A-1. Tribal Groups, Locations of Collection, Investigators, Location of Print Storage and Latitude and Longitude of the Samples Used in this Study.

ETHNIC GROUP	ABBR	GROUP LOCATION	INVESTIGATORS	PRINTS FILED AT: *	LAT	LONG
AKA-PYGMEES	AKA	N. of ITURI R., ZAIRE	M. GUSINDE	A.M.P.G.,BERLIN-DAHL	2N	28E
ANTANDROY	AOY	AMBAROE,EMBANISANGI	NYESSEN	A.M.P.G.,BERLIN,DAHL	25S	46E
ANTANOSY/TANOSY	ASY	AMPASIMENA,MANEVY,MA	NYESSEN	A.M.P.G.,BERLIN-DAHL	25S	47E
BABONGO-PYGMEES	BAB	FRENCH EQUATORIAL AFR.	JULIEN	AEL,LEI	3N	18E
BAGA	BAG	TAIDI/BINARI, GUINEA	W. HERZ	IAH., TUBINGEN	10N	14W
BAKA(H)-PYGMEES	BAK	S. CAMEROONS	JULIEN	AEL,LEI	3N	17E
BAKOLAH-PYGMEES	BKO	CAMEROONS	JULIEN	AEL,LEI	3N	11E
BAMILEKE	BAM	BANGANGTE, CAMEROONS	LEGRAND	IHB, UTRECHT	5N	10E
BAOULE	BAO	IVORY COAST	BRUINSMA & VAN HUIS	IHB, UTRECHT	6N	5W
BASUA-PYGMEES	BAS	ABFANGO, N.E. ZAIRE	M. GUSINDE	A.M.P.G.,BERLIN-DAHL	2N	28E
BETSILEO	BEO	FANDRIENA,SOATANANA	NYESSEN	A.M.P.G.,BERLIN-DAHL	21S	47E
BIENO	BIE	SILVA PORTO, ANGOLA	BREHME	IHA,FR	12S	17E
BOZO	BOZ	MALI		IHB, UTRECHT	14N	5W
BWAKA	BWA	LIBENGE, NW ZAIRE	F. TWIESSELMANN	IR,BRX	3N	18E
CHOKWE(QUIOCO)	CHO	DUNDO, NE ANGOLA	BREHME	IHA,FR	9S	20E
CUANHAMA	CUA	SOUTHERN ANGOLA	JULIEN	AEL,LEI	17S	16E
DOGON	DOG2	SANGA, MALI	HUIZINGA, et al.	IHB, UTRECHT	15N	2W
DOGON-BONI	DOG1	BONI(BANAGA), MALI	HUIZINGA, et al.	IHB, UTRECHT	15N	3W
DOGON-SANGA	DOG3	SANGA, MALI	HUIZINGA, et al.	IHB, UTRECHT	15N	3W
DYOLA	DYO	CASAMANCE,SENEGAL	SYPKENS SMIT	IHB, UTRECHT	13N	16W
EFE-PYGMEES	EFE-2	MABILI, MATANGBA,ZAIRE	M. GUSINDE	A.M.P.G.,BERLIN-DAHL	3N	27E
EFE-PYGMIES	EFE	ANDUDU & MBASA	JULIEN	AEL,LEI	2N	29E
FALI-KANGOU	FAL2	GAROUA,MANDARA MTS	HUIZINGA, et al.	IHB, UTRECHT	10N	13E
FALI-TINGUELIN	FAL3	GAROUA,MANDARA MTS	HUIZINGA, et al.	IHB, UTRECHT	10N	13E
FALI-TORO	FAL1	GAROUA,MANDARA MTS	HUIZINGA, et al.	IHB, UTRECHT	10N	13E
FOULBE	FOU	BASHEO,N-CAMEROON	HUIZINGA, et al.	IHB, UTRECHT	9N	13E
FULANI(PEUL)	FUL	BONI, MALI	HUIZINGA, et al.	IHB, UTRECHT	15N	2W
GINGA	GIN	MALANGE,C-ANGOLA	BREHME	IHA,FR	9S	16E
HEHE	HEH	UHEHE,TANSANIA	ROBERTS, et al.	DHG, NEWCASTLE	8S	36E
KIRDI	KIR	N. CAMEROONS	JULIEN	AEL,LEI	11N	14E
!KUNG-BUSHMEN	BUS	TSUMKWE, NE GROOTFONT.	D. F. ROBERTS	DHG, NEWCASTLE	19S	20E
KURUMBA(FOULSE)	KUR	ROANGA, UPP. VOLTA	HUIZINGA, et al.	IHB, UTRECHT	14N	3W
KUSASI	KUS	N. GHANA	RIGTERS-ARIS	IHB, UTRECHT	10N	1W
LESE(BALESE,MLE	LES	N.OF UPPER ITURI,ZAIRE	M. GUSINDE	A.M.P.G.,BERLIN-DAHL	2N	29E
LUIMBE	LUI	GANDA, CENT. ANGOLA	BREHME	IHA,FR	11S	17E
	MAL	MALAWI		D.A., KNOXVILLE	17S	35E
MAMA	MAM	E. NIGERIA	JULIEN	AEL,LEI	8N	8E
MANGBETU	MAN	3N 18E, NE ZAIRE	M. GUSINDE	A.M.P.G.,BERLIN-DAHL	3N	18E
MERINA (HOVA)	MER	TANANARINO,MADAGASCAR	NYESSEN	A.M.P.G.,BERLIN-DAHL	19S	47E
NDEBELE	NDB	PRETORIA, R.S.A	BREHME & HITZEROTH	IHA,FR	26S	28E
PEDI	PED	PRETORIA, R.S.A.	BREHME & HITZEROTH	IHA,FR	26S	28E
SAKALAVA DU NOR	SDN	MAROVATO,ANTIFIABE	NYESSEN	A.M.P.G.,BERLIN-DAHL	14S	48E
SAMO DU SUD	SAS	NIMINA,SIENA, UP. VOLT	HUZINGA, et al.	IHB, UTRECHT	13N	3W
SHANGAAN	SHA	PRETORIA, R.S.A.	BREHME & HITZEROTH	IHA,FR	26S	28E
SUKUMA	SUK	S. OF LAKE VICTORIA		DHG, NEWCASTLE	3S	33E
TANALA	TAN	AMBALAVAO,KARIANGA	NYESSEN	A.M.P.G.,BERLIN-DAHL	22S	47E

A-1. Continued.

ETHNIC GROUP	ABBR	GROUP LOCATION	INVESTIGATORS	PRINTS FILED AT: *	LAT	LONG
TSWANA	TSW	PRETORIA, R.S.A.	BREHME & HITZEROTH	IHA,FR	26S	28E
VENDA	VEN	PRETORIA, R.S.A.	BREHME & HITZEROTH	IHA,FR	26S	28E
YORUBA	YOR	IFE, NIGERIA	KALMUS	D.A.,KNOXVILLE	7N	4E

* Key to abbreviations:

A.M.P.G., Berlin-Dahl - Max-Plank-Institut, Berlin-Dahlem.
D.A.,Knoxville - Department of Anthropology, Knoxville, Tn.
IHA,FR - Institut fur Anthropologie und Humangenetik, Universitat Freiburg.
DHG, Newcastle - Department of Human Genetics, University of Newcastle upon Tyne.
IR,BRX - Anthropologie Prehistoire de Institut royal des Sciences naturalles de Belgique, Brussels.
IHB, Uterecht - Institute for Human Biology, Uterecht, Netherlands.
AEL,LEI - Anatomical and Embriological Institute, Leiden.
IAH., Tubingen - Institut fur Anthropologie und Humangenetik, Universitat Tubingen.

APPENDIX B

GROUP MEANS FOR DERMATOGLYPHIC TRAITS

B-1. Male Finger Ridge-Count Sample Sizes, Means and Standard Deviations for Each Group Used in this Study, Section 1.

GROUP	N	LIR	RIU	LIIR	LIIU	LIIIR	LIIIU	LIVR	LIVU	LVR	LVU
AKA	105	10.346	3.125	6.327	3.788	9.078	1.845	11.673	3.298	10.067	1.221
		6.829	5.854	5.358	6.219	6.270	5.143	6.298	6.180	5.071	3.577
AOY	41	16.390	9.585	9.805	7.415	13.000	5.317	16.750	7.634	14.171	2.122
		7.067	9.247	6.034	8.255	5.371	7.786	5.242	7.300	4.706	4.360
ASY	40	16.875	10.475	10.750	7.850	14.150	6.525	16.425	7.250	14.000	1.825
		6.073	8.367	5.878	8.414	6.158	8.485	4.924	7.189	4.574	4.248
BAB	129	12.465	9.295	9.056	5.698	10.429	3.643	13.898	4.023	11.983	1.283
		6.960	9.211	5.758	7.291	5.242	6.673	5.687	6.427	5.212	3.114
BAG	101	10.990	6.178	9.330	5.089	10.257	1.950	14.564	3.861	12.693	0.950
		6.742	7.963	5.592	7.061	5.718	5.143	5.212	6.155	4.628	2.868
BAK	130	12.908	9.112	8.768	7.323	10.326	4.008	13.738	4.016	12.016	1.177
		6.478	8.720	5.630	7.583	5.869	6.973	5.549	6.067	4.711	3.173
BAM	45	11.956	4.239	10.065	5.022	11.311	2.400	14.804	5.311	13.652	1.114
		7.274	7.412	5.942	6.668	6.204	5.573	6.270	7.579	4.423	3.363
BAO	283	12.261	6.102	8.894	5.631	10.863	3.127	14.761	3.704	12.835	0.676
		7.021	8.411	5.815	7.558	5.702	6.277	5.672	5.965	4.246	2.553
BAS	22	10.545	1.909	5.364	3.136	8.682	0.136	8.636	3.364	9.636	0.864
		5.510	5.580	5.323	5.651	5.777	0.640	5.811	5.941	5.215	2.833
BEO	45	14.911	7.400	10.311	7.133	14.133	4.089	16.933	7.467	14.800	3.978
		6.748	7.688	5.896	7.656	3.811	6.937	4.469	7.928	3.609	5.529
BIE	68	13.691	7.397	8.706	5.206	12.309	3.059	14.485	4.691	12.426	1.574
		6.575	9.039	5.743	7.587	5.890	6.071	5.578	6.959	4.695	3.683
BKO	124	13.440	8.992	9.512	5.286	11.574	3.672	14.951	5.593	13.177	1.903
		6.814	8.106	5.815	6.867	6.198	6.579	5.859	6.695	4.612	4.051
BOZ	131	12.786	5.740	9.461	4.535	11.023	2.962	14.612	4.721	12.641	1.211
		7.041	8.261	5.903	7.117	5.918	5.913	5.909	7.051	4.655	3.203
BUS	75	8.973	1.986	5.176	4.730	7.055	1.162	11.568	0.270	7.053	0.000
		6.440	5.367	5.844	6.632	5.497	4.243	6.244	1.707	4.719	0.000
CHO	90	15.100	8.167	9.367	5.100	11.900	3.300	15.322	5.022	13.533	1.233
		7.183	8.476	5.887	7.002	5.230	6.038	5.203	7.153	3.958	3.315
CUA	68	10.791	4.258	8.485	2.621	11.206	2.353	14.212	2.912	12.239	0.574
		6.894	7.145	5.724	5.604	5.265	5.060	5.278	5.165	4.736	2.083

B-1. Continued.

GROUP	N	LIR	RIU	LIIR	LIIU	LIIIR	LIIIU	LIVR	LIVU	LVR	LVU
DOG1	50	10.860	4.260	8.898	3.204	10.792	1.245	13.800	2.920	12.280	0.800
		7.524	7.306	5.713	5.204	5.634	3.843	5.928	5.616	4.712	2.619
DOG2	158	11.405	6.196	9.541	4.618	12.051	2.981	16.224	5.667	13.215	1.000
		7.136	8.233	5.755	7.134	5.195	6.313	5.663	7.254	4.876	2.948
DYO	184	12.435	6.787	8.857	4.199	10.505	2.130	13.989	4.130	12.530	1.044
		7.155	7.662	6.038	6.496	6.071	5.102	6.337	6.318	4.493	3.051
EFE	115	10.096	3.646	6.852	2.896	8.190	1.267	10.304	2.687	8.982	0.741
		7.388	6.337	5.759	5.239	5.874	4.012	6.259	5.348	5.214	2.366
EFE2	79	9.418	2.089	6.372	3.128	7.759	2.076	10.532	2.177	8.911	0.759
		6.242	4.828	5.666	5.471	5.884	5.040	6.561	4.565	5.345	2.733
FAL1	92	13.078	8.333	9.556	7.878	11.348	5.457	15.283	7.185	13.890	1.637
		7.393	8.546	5.677	8.032	5.712	7.921	5.679	7.607	4.103	4.004
FAL2	55	12.727	8.800	9.519	6.382	11.833	3.444	15.691	5.236	13.436	1.473
		6.550	8.935	6.261	7.612	5.619	6.221	6.256	6.359	5.459	3.834
FAL3	70	13.329	8.000	9.235	4.662	10.714	2.943	15.143	6.559	12.700	1.386
		6.782	8.330	6.388	6.940	6.237	6.483	6.838	7.089	5.126	3.320
FOU	78	14.000	8.789	9.520	6.487	11.130	3.679	15.218	5.346	13.756	0.833
		7.325	8.849	6.278	7.488	6.101	6.305	5.500	6.755	4.228	2.670
FUL	56	11.768	6.786	9.291	7.481	10.571	5.393	14.286	5.679	12.073	1.345
		7.734	8.232	6.220	7.563	6.269	7.419	5.470	6.960	4.281	3.222
GIN	94	13.351	5.723	8.362	4.372	11.915	2.830	14.809	4.309	12.383	1.287
		7.332	8.133	5.630	6.735	5.562	6.157	5.027	7.092	4.607	3.659
HEH	110	13.862	7.138	8.706	5.679	10.972	3.303	13.229	3.734	11.367	1.294
		7.022	8.513	5.814	7.000	5.950	6.362	6.093	6.440	5.165	3.539
KIR	79	11.676	4.987	8.845	3.911	10.208	1.667	13.408	3.377	11.899	0.709
		7.025	7.066	4.872	6.054	5.518	4.555	5.284	5.774	4.084	2.424
KUR	138	12.533	5.897	8.728	6.321	10.841	3.290	15.109	4.442	12.812	0.739
		7.487	8.098	6.053	7.601	6.046	6.446	6.115	6.958	4.927	2.735
KUS	48	11.083	6.167	9.083	5.292	11.438	2.500	15.500	5.688	13.771	0.854
		8.018	8.481	5.982	7.020	6.287	5.128	5.426	6.399	4.732	2.828
LES	55	12.582	5.473	8.273	3.691	8.815	1.148	12.981	2.130	11.222	0.907
		6.776	8.217	6.805	5.913	5.313	3.373	5.458	4.699	5.109	3.176

B-1. Continued.

GROUP	N	LIR	RIU	LIIR	LIIU	LIIIR	LIIIU	LIVR	LIVU	LVR	LVU
LUI	87	14.207	6.793	9.023	4.471	11.425	2.276	14.356	4.207	12.828	1.517
		6.533	8.328	6.019	6.775	5.211	5.658	5.417	5.954	4.512	4.017
MAM	105	13.750	8.827	9.796	5.738	12.631	3.854	16.311	4.650	14.067	1.019
		6.362	8.699	5.255	7.366	5.219	6.929	5.483	6.293	4.193	3.274
MAN	29	13.241	7.276	7.862	6.483	11.000	3.793	14.897	4.724	12.966	0.207
		5.920	8.685	6.865	6.796	4.971	7.311	3.589	6.886	3.600	1.114
MER	35	18.000	5.914	9.371	6.743	12.857	3.971	15.771	5.514	13.229	1.629
		5.770	7.698	6.069	7.547	4.590	7.521	5.191	7.286	3.020	3.573
NDB	21	12.095	4.524	6.524	3.714	10.095	1.905	14.000	2.952	11.048	0.190
		8.160	6.925	5.741	6.182	5.682	4.826	6.237	5.084	5.094	0.873
PED	85	13.624	6.188	8.941	4.165	11.047	2.812	14.271	4.553	12.188	1.341
		7.345	8.442	5.637	6.752	5.457	6.578	5.456	6.677	5.063	3.379
SAS	112	10.804	4.679	8.185	3.661	10.153	2.643	14.464	4.839	12.000	0.813
		7.960	7.452	6.122	6.367	6.263	6.240	5.965	6.875	4.520	2.733
SDN	30	15.033	8.067	12.067	4.500	13.233	2.167	14.700	5.533	12.067	1.333
		6.667	7.400	5.258	7.200	5.042	5.279	5.516	7.440	4.068	4.172
SHA	92	11.717	6.522	8.304	5.859	9.609	2.620	13.315	3.761	12.207	0.978
		7.344	8.453	5.844	7.966	6.177	6.007	6.022	6.478	4.542	3.060
SUK	54	13.500	7.037	7.333	5.556	11.241	1.630	13.685	4.426	11.111	0.630
		6.327	8.676	6.003	7.513	5.885	4.186	5.333	6.447	4.773	2.192
TAN	48	15.042	6.021	10.854	5.333	13.583	4.333	15.298	6.553	12.146	1.354
		6.565	7.614	5.838	6.777	5.111	6.758	5.291	7.737	4.486	3.355
TSW	92	12.967	6.022	9.272	5.652	12.554	3.793	15.283	4.946	12.022	0.783
		7.288	7.817	5.897	7.294	5.185	7.152	5.232	7.126	4.704	2.571
VEN	66	15.106	6.606	11.712	8.167	13.576	5.212	16.333	5.197	13.758	0.273
		6.666	8.472	5.374	7.893	5.455	7.844	5.199	6.993	3.807	1.564
YOR	119	12.765	6.975	8.462	5.723	11.370	4.160	15.353	5.017	13.420	0.941
		6.620	8.388	6.146	7.363	5.575	7.222	6.057	6.741	4.439	3.046

B-2. Male Finger Ridge-Count Sample Sizes, Means and Standard Deviations for Each Group Used in this Study, Section 2.

GROUP	N	RIR	RIU	RIIR	RIIU	RIIIR	RIIIU	RIVR	RIVU	RVR	RVU
AKA	105	12.457	3.419	7.429	2.667	9.619	1.248	12.267	3.105	10.467	1.558
		7.321	6.243	5.282	5.138	5.466	4.278	6.364	5.864	4.844	4.007
AOY	41	17.927	11.585	9.049	7.463	13.146	4.195	16.341	8.341	14.415	2.317
		7.285	8.877	6.511	7.830	5.151	6.994	4.322	7.388	4.615	4.469
ASY	40	17.550	13.075	7.875	9.825	12.750	5.575	16.300	8.625	13.825	2.000
		7.168	8.486	6.653	9.142	5.358	8.067	5.478	7.192	5.002	4.409
BAB	129	13.760	8.067	9.153	4.792	10.556	2.631	14.336	4.656	11.878	1.341
		6.786	8.387	5.667	6.938	5.256	6.008	5.338	6.963	5.465	3.240
BAG	101	12.960	6.129	8.426	5.990	10.010	2.465	13.772	4.188	12.842	1.020
		6.776	8.110	5.450	7.340	4.700	5.421	5.651	6.130	4.593	2.728
BAK	130	14.437	10.678	8.835	7.570	9.289	4.053	13.236	5.397	11.974	1.289
		5.558	8.485	5.388	7.504	5.490	6.747	5.605	6.854	4.295	3.290
BAM	45	13.867	4.844	9.568	4.622	11.556	1.957	14.356	4.222	12.422	2.109
		7.216	7.743	5.538	6.645	5.979	4.472	5.785	6.190	4.779	4.725
BAO	283	13.437	7.965	8.357	6.173	10.338	3.257	14.877	5.169	12.587	1.035
		7.010	8.714	5.470	7.557	5.311	6.140	5.663	6.692	4.674	2.957
BAS	22	12.409	3.273	7.773	3.091	9.091	0.773	11.227	3.591	10.091	1.227
		5.909	6.453	5.415	5.424	5.863	2.506	5.879	6.139	5.415	3.337
BEO	45	16.891	10.065	10.630	8.667	13.022	4.087	16.870	10.413	13.826	4.087
		6.111	8.833	4.621	8.177	4.712	6.706	3.769	7.449	4.864	5.819
BIE	68	14.676	8.368	9.588	5.147	11.618	3.603	15.926	6.059	13.176	1.338
		6.018	9.238	5.368	7.496	4.785	6.582	5.216	7.316	4.769	3.428
BKO	124	14.910	9.516	9.934	5.150	10.839	2.750	14.910	5.106	12.825	1.752
		6.532	7.921	5.655	6.747	5.128	5.686	5.355	6.267	4.897	3.976
BOZ	131	14.458	7.557	8.859	4.680	10.802	2.100	14.107	5.847	12.155	1.395
		6.606	8.585	5.987	6.922	5.610	5.207	5.920	7.002	4.861	3.367
BUS	75	11.307	5.797	4.521	4.608	7.613	1.413	13.149	1.548	8.693	0.013
		7.168	7.942	5.556	6.591	4.727	4.636	5.898	4.305	5.024	0.115
CHO	90	16.416	9.618	9.511	4.633	11.667	2.656	15.489	4.500	13.522	1.478
		6.369	9.564	5.738	6.624	5.197	5.904	5.317	6.583	4.533	3.520
CUA	68	13.221	4.910	8.104	4.328	10.167	2.833	14.824	4.746	11.910	1.176
		6.913	7.329	5.067	6.496	5.128	5.745	4.968	6.817	4.313	3.269

B-2. Continued.

GROUP	N	RIR	RIU	RIIR	RIIU	RIIIR	RIIIU	RIVR	RIVU	RVR	RVU
DOG1	50	12.489	8.130	8.959	5.061	9.980	2.480	14.280	4.760	11.980	1.020
		8.327	8.831	5.605	7.215	5.316	5.953	5.932	6.545	4.753	3.622
DOG2	158	12.462	8.316	9.494	5.646	10.975	2.395	16.342	6.627	13.408	1.325
		7.244	8.631	5.810	7.586	5.074	5.456	5.417	7.179	5.056	3.193
DYO	184	13.330	8.027	8.422	4.706	9.787	2.262	14.268	5.676	13.000	1.317
		7.198	8.474	6.041	6.536	5.834	4.983	6.023	7.119	4.433	3.567
EFE	115	12.105	4.544	7.292	3.071	8.421	0.719	11.733	3.560	9.983	1.617
		7.608	6.851	5.288	5.288	5.608	3.133	6.284	5.708	5.712	3.808
EFE2	79	10.859	2.987	7.078	3.104	8.051	1.423	10.948	2.987	9.364	1.256
		6.252	6.361	5.911	5.243	5.494	3.979	6.126	5.307	5.052	3.277
FAL1	92	15.292	8.289	9.444	6.239	10.620	3.848	15.933	6.736	13.000	1.923
		6.064	8.525	5.219	7.355	5.193	6.643	5.554	7.504	3.856	4.188
FAL2	55	14.109	10.164	9.870	5.800	10.564	3.491	15.745	6.618	13.127	1.636
		6.713	9.560	4.703	8.434	4.764	5.984	6.035	7.289	4.587	3.969
FAL3	70	15.174	9.725	9.829	4.943	9.671	3.757	15.371	7.943	13.232	1.913
		6.176	8.516	6.002	8.281	6.185	6.380	7.127	7.572	4.339	3.962
FOU	78	16.307	10.026	9.197	6.077	10.269	2.846	15.935	6.039	13.013	0.974
		6.069	8.451	5.655	7.214	5.792	5.931	5.897	6.916	4.783	2.695
FUL	56	13.286	7.036	9.593	6.537	9.889	3.273	13.964	6.268	11.929	1.214
		7.684	8.014	5.715	6.627	5.869	5.785	5.095	7.010	4.289	2.865
GIN	94	15.000	7.149	9.074	5.436	11.223	2.766	14.532	5.489	12.660	1.489
		7.245	8.694	6.177	7.273	4.755	5.945	5.425	7.322	5.136	3.729
HEH	110	15.358	7.991	9.645	5.336	10.891	2.509	13.872	4.376	12.009	1.183
		6.735	8.275	5.530	6.922	5.531	5.494	5.712	6.323	5.313	3.403
KIR	79	14.167	4.811	8.397	3.709	9.911	1.713	13.145	4.213	12.026	1.049
		6.991	7.437	5.218	6.058	4.839	4.584	5.163	6.199	4.718	2.867
KUR	138	13.275	7.326	8.481	5.971	9.935	3.266	15.094	5.403	12.188	1.007
		7.170	8.770	5.666	7.395	5.360	6.270	6.141	7.337	4.952	3.138
KUS	48	12.771	7.146	9.234	6.085	11.000	2.688	15.255	5.500	13.771	1.875
		8.213	8.354	5.619	7.177	5.497	5.915	4.775	6.533	4.696	4.315
LES	55	13.870	6.111	7.963	3.296	8.906	0.623	12.208	2.264	11.800	0.400
		6.874	8.998	5.723	5.656	4.516	2.719	5.940	4.621	4.790	1.571

B-2. Continued.

GROUP	N	RIR	RIU	RIIR	RIIU	RIIIR	RIIIU	RIVR	RIVU	RVR	PVU
LUI	87	15.287	6.954	9.080	4.494	11.253	1.793	15.069	5.437	13.402	1.575
		6.825	8.679	6.076	6.637	4.415	5.465	5.398	6.412	5.054	3.817
MAM	105	15.173	10.971	9.933	5.771	12.019	3.638	16.905	4.952	14.410	1.124
		6.033	8.767	4.754	7.177	4.517	6.534	4.577	6.514	3.862	3.581
MAN	29	14.483	6.966	10.586	4.241	10.966	1.931	15.552	3.621	12.828	0.759
		7.155	8.926	4.664	6.566	3.877	5.338	4.050	5.741	3.566	2.278
MER	35	18.400	8.171	8.971	8.457	13.086	3.686	15.857	7.057	13.771	3.029
		6.643	8.900	6.451	7.547	4.598	6.794	4.160	7.471	4.138	5.193
NOB	21	11.333	6.381	7.381	3.952	10.000	2.238	14.857	5.238	11.619	1.714
		8.828	8.669	5.617	6.320	4.940	4.774	4.902	6.992	4.995	4.451
PED	85	16.059	6.671	9.812	4.141	10.965	1.812	14.718	4.235	12.729	0.906
		7.142	8.211	5.487	6.585	5.199	5.220	6.103	6.282	4.883	2.684
SAS	112	12.768	6.089	8.393	4.348	10.000	2.117	14.518	5.518	12.081	0.696
		7.958	7.793	5.898	6.750	5.459	5.293	6.334	6.736	4.718	2.691
SON	30	16.167	11.633	9.172	5.448	12.828	2.200	16.933	7.067	12.400	2.033
		6.243	8.704	5.708	8.551	4.878	5.744	4.409	6.963	4.804	4.271
SHA	92	12.576	6.772	8.913	6.315	9.859	2.761	13.620	4.783	12.163	0.957
		7.678	8.703	5.574	8.007	5.276	6.179	6.385	6.922	4.944	2.931
SUK	54	15.463	7.278	9.000	3.926	11.167	1.815	14.963	3.481	11.685	0.537
		6.336	8.826	5.481	6.216	5.262	4.409	5.380	5.400	4.706	2.271
TAN	48	16.292	7.021	10.021	6.333	12.833	4.271	15.646	7.854	12.000	2.128
		6.398	7.894	5.644	6.932	4.870	6.371	5.302	7.311	4.462	4.485
TSW	92	14.370	7.478	9.120	6.717	12.533	3.913	15.478	5.598	12.283	1.391
		7.744	8.584	6.279	7.702	4.825	6.593	5.714	7.057	4.927	3.278
VEN	66	15.818	7.561	10.848	8.545	12.439	4.909	17.015	7.379	13.470	0.864
		7.123	9.162	5.889	7.849	5.635	7.151	4.994	7.300	4.865	2.903
YOR	119	15.050	8.076	8.697	6.336	10.588	3.664	15.746	6.237	13.729	0.898
		6.561	8.647	6.089	7.244	5.486	6.826	6.075	7.303	4.706	3.153

B-3. Female Finger Ridge-Count Sample Sizes, Means and Standard Deviation for Each Group Used in this Study, Section 1.

GROUP	N	LIR	LIU	LIIR	LIIU	LIIIR	LIIIU	LIVR	LIVU	LVR	LVU
AKA	90	9.311	4.478	5.522	3.267	7.911	1.033	10.322	1.978	8.611	1.111
		6.626	6.152	5.469	5.522	5.499	3.692	6.048	4.662	5.295	3.146
BAB	124	11.250	9.935	8.455	6.041	10.041	3.184	13.467	3.878	11.103	1.379
		6.965	8.644	5.439	8.098	5.929	6.271	5.618	5.909	5.253	3.542
BAG	74	10.392	6.662	8.054	4.892	9.446	2.500	14.162	4.378	11.616	0.671
		6.672	7.741	5.401	7.078	6.005	5.696	6.066	6.440	4.530	2.351
BAK	108	12.074	8.981	8.101	6.873	9.612	2.806	13.153	3.500	11.344	1.183
		7.531	7.733	5.818	7.173	5.894	5.594	5.844	5.672	4.763	3.306
BAM	38	9.737	4.622	6.417	4.919	8.205	1.256	12.316	2.222	10.526	0.368
		6.892	7.606	5.299	7.084	5.492	4.541	6.543	5.100	5.326	2.271
BAO	125	10.960	5.408	8.863	3.952	10.355	2.548	13.920	3.592	11.896	0.968
		6.922	7.596	5.822	6.861	6.245	5.587	6.517	6.317	5.110	3.157
BAS	103	8.893	4.559	5.941	3.297	7.167	1.137	10.402	3.703	8.824	0.942
		5.929	6.231	5.359	5.677	5.713	3.656	6.472	5.782	5.258	2.693
BIE	71	12.197	6.507	7.014	4.183	10.225	1.662	13.352	3.183	11.437	0.901
		6.380	7.735	5.615	6.713	5.172	4.579	5.391	5.832	4.792	2.752
BKO	101	12.386	10.723	8.216	5.845	10.939	3.090	13.888	4.475	12.420	1.530
		6.375	7.814	5.810	7.520	5.714	6.072	6.402	6.352	5.420	3.468
BUS	42	8.333	3.881	5.976	5.146	8.429	0.929	11.405	1.000	6.286	0.000
		7.190	7.778	5.837	6.366	6.615	3.481	7.198	3.276	4.979	0.000
CHO	90	12.933	6.467	9.089	3.678	11.578	2.767	14.833	4.378	11.911	1.478
		6.011	7.375	5.698	6.191	5.627	6.186	5.474	6.508	5.000	3.673
CUA	46	9.326	3.174	6.630	2.000	9.413	1.196	12.044	1.222	9.341	0.391
		6.243	6.144	5.293	4.280	5.365	3.563	5.253	3.642	4.524	1.868
DOG2	106	9.623	6.670	7.695	5.048	9.953	3.255	14.724	4.095	11.745	0.925
		7.324	7.964	5.630	7.029	5.739	6.465	6.612	6.164	5.326	2.551
DYO	61	10.532	7.000	7.758	5.000	9.823	1.258	14.065	4.677	12.226	1.581
		7.010	7.893	6.363	6.926	6.075	4.559	6.478	6.791	5.000	4.171
EFE	52	10.346	4.423	6.611	3.648	7.389	1.556	10.907	3.094	9.302	1.377
		6.817	6.017	6.058	6.110	5.938	4.355	6.542	5.318	5.455	3.046
EFE2	34	9.000	1.588	6.424	1.273	7.853	1.676	9.588	1.912	7.455	0.636
		7.058	4.900	5.745	3.923	6.282	4.484	6.359	4.295	5.154	2.572

B-3. Continued.

GROUP	N	LIR	LIU	LIIR	LIIU	LIIIR	LIIIU	LIVR	LIVU	LVR	LVU
FAL1	56	12.071	10.304	8.500	7.250	10.518	4.107	15.741	5.704	12.607	1.964
		7.390	8.382	5.679	7.775	5.957	6.851	5.274	6.383	4.579	4.081
FAL2	28	8.857	7.143	8.444	7.143	10.036	4.036	13.821	4.393	12.714	1.000
		6.991	8.308	5.416	8.488	5.581	6.215	6.219	6.707	3.354	2.802
FOU	39	11.718	5.974	8.000	4.462	10.650	0.775	14.375	4.667	12.025	0.400
		5.916	7.805	5.056	6.774	4.492	2.315	4.876	6.153	3.919	1.392
GIN	94	13.191	7.543	8.638	4.372	11.000	2.638	14.617	3.723	11.702	0.947
		6.258	8.626	5.567	6.951	5.458	5.658	6.103	6.567	4.779	2.934
HEH	90	10.573	5.607	6.989	3.966	9.820	2.528	12.494	3.663	10.348	0.910
		6.609	7.536	5.509	6.830	5.125	6.131	5.558	6.312	5.126	3.277
KIR	33	9.133	3.688	8.133	1.500	8.667	0.344	10.032	1.281	10.419	0.333
		6.185	5.932	4.754	3.681	5.010	1.945	5.050	3.549	4.617	1.915
KUR	140	9.550	6.407	7.360	4.784	9.471	2.221	13.950	3.579	11.750	0.486
		6.862	7.654	5.420	7.248	6.023	5.599	6.968	5.691	5.294	2.069
LES	32	11.500	6.781	7.938	4.344	10.594	1.344	12.938	3.938	11.250	0.781
		7.117	7.836	5.130	5.998	4.493	3.781	5.553	5.674	5.137	2.472
LUI	75	11.893	8.667	8.453	5.747	11.627	2.653	14.560	5.307	12.160	0.933
		6.884	8.340	6.167	7.064	5.291	5.574	6.187	6.784	4.824	3.024
MAM	73	11.658	7.575	8.918	7.041	11.438	5.027	16.493	5.167	13.329	0.795
		6.860	8.110	5.795	8.032	6.194	7.427	6.092	6.730	4.522	2.896
MER	62	14.129	5.754	10.742	7.048	13.597	4.210	15.361	5.689	12.742	2.323
		6.339	7.343	5.845	7.526	4.699	7.083	5.066	7.042	4.760	4.080
NDB	43	11.279	5.581	8.651	5.488	10.721	2.186	13.372	3.860	10.302	0.721
		7.744	7.487	5.614	7.346	5.696	5.091	6.440	6.494	5.253	2.292
PED	92	11.076	7.000	7.815	4.337	9.446	2.696	13.076	3.413	11.196	1.033
		8.197	8.722	6.186	6.925	6.358	5.968	6.213	6.459	5.433	3.379
SAS	95	10.105	4.453	8.474	4.000	10.400	1.663	13.558	3.832	10.589	0.832
		7.176	6.805	5.297	6.240	5.536	4.646	6.128	6.241	4.986	2.592
SDN	21	16.619	8.952	11.190	4.286	12.905	3.762	15.857	5.238	13.857	1.429
		4.706	8.417	5.501	8.486	4.763	6.228	4.618	7.014	3.468	3.842
SHA	90	10.844	6.067	7.878	5.956	10.144	2.133	13.500	3.689	10.811	0.678
		6.584	8.033	5.960	7.374	6.114	5.430	6.683	5.939	5.425	2.449

B-3. Continued.

GROUP	N	LIR	LIU	LIIR	LIIU	LIIIR	LIIIU	LIVR	LIVU	LVR	LVU
TSW	87	10.115	5.230	7.885	2.644	9.713	2.598	11.736	4.149	9.632	0.897
		7.797	8.169	5.850	5.363	5.934	6.074	6.972	6.569	5.572	3.267
VEN	66	11.773	6.091	7.818	5.697	9.818	2.758	14.394	3.667	11.727	0.742
		6.741	8.065	5.449	7.376	5.917	5.889	5.577	6.006	4.705	2.691
YOR	55	10.236	5.109	7.836	5.582	10.407	3.167	14.000	3.200	11.836	1.000
		7.134	8.130	6.353	7.774	6.380	7.030	6.616	6.004	4.872	2.981

B-4. Female Finger Ridge-Count Sample Sizes, Means and Standard Deviation for Each Group Used in this Study, Section 2.

GROUP	N	RIR	RIU	RIIR	RIIU	RIIIR	RIIIU	RIVR	RIVU	RVR	RVU
AKA	90	10.711	3.778	7.222	1.522	8.433	0.422	11.511	2.289	9.144	0.689
		6.615	6.532	5.034	3.875	4.837	2.000	5.837	4.727	4.701	2.311
BAB	124	12.034	9.468	8.838	4.718	9.919	2.032	13.902	4.098	11.890	1.314
		7.421	8.718	5.144	7.163	5.315	5.199	5.858	5.986	5.021	3.132
BAG	74	12.486	6.392	8.770	5.297	10.014	1.230	14.230	4.541	11.851	1.149
		6.685	7.490	5.639	7.146	4.989	3.677	6.058	6.538	4.951	3.126
BAK	108	13.586	10.620	8.170	6.856	9.531	3.450	12.708	4.104	11.678	0.890
		5.959	8.722	5.471	7.314	5.546	5.840	5.753	5.925	4.855	2.348
BAM	38	12.211	4.895	7.313	4.189	9.108	1.077	12.641	3.615	11.526	0.842
		7.422	7.446	6.468	6.123	5.877	3.869	6.815	5.910	4.683	3.071
BAO	125	12.419	5.863	8.724	4.577	10.202	1.677	14.280	5.240	11.677	0.589
		7.143	8.004	6.002	6.969	5.585	4.743	6.524	6.912	5.073	2.436
BAS	103	11.107	3.495	7.931	2.422	8.373	0.515	12.146	3.136	9.621	0.786
		5.975	5.809	5.268	4.779	4.957	2.551	6.176	5.317	4.867	2.444
BIE	71	13.761	6.648	8.563	2.676	10.408	0.958	15.085	2.606	12.634	0.831
		6.707	8.165	5.739	5.321	4.868	3.686	4.604	4.984	4.782	2.918
BKO	101	14.139	10.000	8.990	4.420	10.653	2.931	14.440	4.190	12.470	1.540
		6.716	8.437	5.241	6.467	5.561	5.787	5.851	6.292	5.114	3.569
BUS	42	11.000	6.026	5.048	6.286	7.810	1.952	13.071	2.214	7.048	0.000
		6.867	7.969	5.613	7.178	5.420	5.428	6.841	4.599	4.813	0.000
CHO	90	14.344	7.611	9.444	2.889	11.933	1.333	15.689	3.500	12.789	1.156
		6.521	8.400	5.436	5.721	4.370	4.083	5.144	5.721	5.016	3.009
CUA	46	10.696	3.870	7.935	2.761	9.283	0.891	11.909	1.600	9.022	0.000
		6.928	6.619	5.670	5.208	5.102	3.295	5.681	4.064	4.654	0.000
DOG2	106	10.731	7.115	7.846	5.298	9.865	2.654	14.829	5.000	11.914	1.067
		7.215	8.343	5.306	7.394	5.186	5.935	6.641	6.259	5.409	2.930
DYO	61	12.869	6.770	8.048	4.758	10.194	1.887	14.548	5.500	12.677	1.323
		6.576	7.913	5.579	6.835	5.453	5.239	6.303	6.755	4.895	3.643
EFE	52	11.130	3.759	7.815	2.852	9.333	0.706	12.264	2.943	9.889	0.778
		6.794	6.216	5.136	5.652	5.567	2.859	6.475	5.461	5.046	2.515
EFE2	34	10.848	2.909	8.152	2.031	7.879	0.818	9.818	3.697	7.364	0.697
		6.685	5.664	5.392	4.941	5.158	3.653	6.317	5.660	4.891	2.468

B-4. Continued.

GROUP	N	RIR	RIU	RIIR	RIIU	RIIIR	RIIIU	RIVR	RIVU	RVR	RVU
FAL1	56	13.196	8.825	10.123	5.509	10.964	2.768	16.909	4.836	12.161	1.263
		7.332	8.231	4.706	7.792	5.045	5.976	4.695	6.562	4.447	3.091
FAL2	28	10.214	6.036	9.519	5.667	10.214	0.852	15.607	3.607	12.393	0.429
		6.735	7.426	5.294	7.565	4.298	3.072	6.297	6.094	3.891	2.268
FOU	39	12.750	5.676	8.757	2.923	9.895	0.079	14.579	3.237	12.275	0.300
		5.983	7.803	4.974	5.635	4.367	0.487	4.421	5.360	3.471	1.324
GIN	94	14.181	7.872	9.787	3.926	11.447	2.064	15.574	4.085	12.138	0.660
		6.492	8.354	5.001	6.328	5.580	5.199	6.028	6.689	4.863	2.491
HEH	90	12.400	4.978	8.678	2.922	10.889	1.256	13.556	3.144	10.789	0.411
		6.685	7.230	5.212	5.533	4.501	4.392	5.581	5.578	4.689	1.925
KIR	33	10.625	3.727	7.879	1.969	8.515	0.941	11.344	1.970	10.406	0.000
		6.084	5.896	4.942	4.468	4.309	3.228	5.851	4.073	5.002	0.000
KUR	140	10.883	6.449	7.585	4.816	9.511	1.863	14.281	3.900	11.671	0.493
		7.136	7.990	5.295	7.241	5.464	5.329	6.748	6.128	5.380	1.991
LES	32	12.433	4.645	9.000	3.750	10.875	0.969	13.000	3.938	10.531	0.313
		6.663	7.163	3.984	6.206	4.187	3.116	4.663	5.781	3.844	1.256
LUI	75	12.987	7.480	9.640	4.160	11.653	1.907	15.453	4.413	12.107	0.507
		6.463	8.587	5.237	6.627	4.660	4.910	5.969	6.481	4.516	2.511
MAM	73	13.472	8.425	9.068	6.849	11.027	3.438	16.347	6.055	13.620	0.904
		7.138	8.416	5.218	8.386	5.276	6.803	5.531	7.331	4.327	2.714
MER	62	15.839	7.656	10.645	7.161	12.774	3.097	16.066	7.371	12.525	2.532
		6.384	7.728	5.223	7.851	4.990	6.018	5.406	6.891	4.307	4.731
NDB	43	13.512	6.419	9.814	5.814	10.837	2.465	13.953	5.023	11.233	0.698
		7.497	8.293	5.607	6.832	4.855	5.492	6.579	6.766	5.145	2.294
PED	92	12.630	6.315	8.696	3.924	10.174	1.554	13.359	3.804	11.174	0.489
		8.219	8.543	5.950	6.491	5.683	4.215	6.443	6.211	5.257	2.420
SAS	95	11.274	3.853	8.989	3.442	10.021	1.158	14.747	3.989	11.211	0.811
		7.147	6.319	5.060	6.195	4.747	3.791	5.722	6.224	5.375	2.707
SDN	21	16.905	7.571	11.190	5.667	12.095	1.476	16.650	6.050	14.600	1.333
		6.804	8.115	5.354	7.193	4.774	3.919	4.452	7.265	4.394	3.483
SHA	90	12.811	4.689	9.667	4.689	10.656	1.278	13.867	3.422	11.433	0.656
		6.470	7.288	5.334	7.223	5.355	4.381	6.893	5.909	5.228	2.496

B-4. Continued.

GROUP	N	RIR	RIU	RIIR	RIIU	RIIIR	RIIIU	RIVR	RIVU	RVR	RVU
TSW	87	11.897	4.126	8.897	3.667	10.057	1.701	13.057	3.851	10.264	0.632
		7.748	7.337	5.825	6.228	5.429	5.190	6.641	6.057	5.127	2.516
VEN	66	13.621	5.939	9.258	4.091	10.561	1.394	15.182	3.773	12.091	0.470
		6.387	7.682	5.467	6.389	4.635	4.117	5.764	6.358	5.200	2.342
YOR	55	11.709	4.891	8.309	5.818	10.145	2.618	15.200	3.800	12.055	0.909
		6.898	7.762	5.591	8.179	5.268	6.399	5.592	6.612	4.763	2.598

B-5. Palmar Ridge-Count Sample Sizes, Means and Standard Deviations for Each Group Used in this Study.

	MALES							FEMALES					
GROUP	N	LC-D	LB-C	LA-B	RA-B	RB-C	RC-D	N	LC-D	LB-C	LA-B	RA-B	RB-C	RC-D
AKA	105	35.152	28.390	35.952	34.457	28.886	34.371	90	36.000	27.966	35.222	34.211	29.247	34.517
		6.169	6.490	4.815	4.967	5.661	4.672		5.467	5.210	5.014	4.193	5.531	6.124
AOY	40	35.875	27.300	39.500	39.795	28.205	35.975							
		6.918	5.450	6.026	6.300	5.904	6.874							
ASY	45	35.279	28.386	37.933	37.250	28.000	34.571							
		6.881	5.208	5.336	4.784	5.653	7.054							
BAG	98	34.289	27.542	37.633	36.168	27.207	34.348	73	34.973	27.931	37.819	36.972	27.274	35.192
		7.575	6.215	5.659	5.935	5.359	6.935		6.825	5.434	4.839	5.074	5.860	5.981
BAK	73	33.048	26.386	36.671	34.792	26.295	33.897	62	34.475	27.172	38.581	37.000	26.576	37.313
		6.413	6.375	4.292	4.365	6.723	7.639		5.838	6.581	5.753	6.329	5.890	6.281
BAM	86	35.410	28.595	39.122	37.524	28.953	35.655	90	35.292	27.867	38.708	38.080	28.311	35.659
		6.675	5.353	5.625	5.338	5.524	6.454		6.627	6.280	5.505	5.004	5.708	5.703
BAO	223	34.311	26.572	37.646	36.482	27.140	35.176	121	35.342	27.273	37.861	36.615	27.926	35.533
		6.709	6.489	5.295	5.503	5.853	5.999		6.532	5.685	4.833	5.059	6.087	5.594
BAS	21	34.286	24.550	36.200	34.364	26.409	35.095	103	34.553	26.359	35.709	34.350	27.194	33.796
		4.776	5.365	4.538	5.678	5.077	4.379		6.127	6.034	4.775	5.070	5.418	6.062
BEO	45	34.159	26.422	38.622	37.455	26.372	34.978							
		6.531	5.306	4.212	4.668	5.283	6.061							
BIE	71	36.366	27.549	38.239	37.789	28.282	36.873	73	36.877	28.849	39.548	39.110	29.507	36.575
		6.468	6.071	4.496	4.632	6.275	5.603		7.065	5.256	5.367	5.293	6.187	6.355
BOZ	116	33.816	26.876	36.853	36.365	26.547	35.593							
		6.943	6.058	5.098	4.789	5.656	5.939							
BUS	78	34.130	22.974	37.519	35.590	23.896	35.286	42	33.929	22.429	38.143	36.310	23.500	34.262
		5.001	5.633	5.251	5.146	5.623	4.495		6.376	5.324	4.662	4.698	6.232	5.860
BWA	99	36.045	27.709	38.465	37.679	28.135	36.519	101	35.875	26.416	38.525	37.415	25.575	36.290
		6.948	5.206	5.269	5.298	5.964	4.531		7.392	5.295	4.778	4.234	5.718	5.475
CHO	92	36.859	28.870	39.250	38.457	28.293	37.163	87	37.322	28.276	39.299	38.149	28.115	37.575
		5.532	5.794	5.674	6.384	5.152	5.248		6.666	5.939	5.530	5.388	5.872	5.774
CUA	83	34.275	26.181	38.841	37.507	27.590	36.012	70	36.030	27.076	39.300	38.729	27.647	37.345
		6.799	6.182	5.410	5.268	5.708	5.749		5.877	5.666	5.265	4.518	5.458	5.711

B-5. Continued.

GROUP	MALES N	LC-D	LB-C	LA-B	RA-B	RB-C	RC-D	FEMALES N	LC-D	LB-C	LA-B	RA-B	RB-C	RC-D
DOG1	45	34.455	26.955	38.600	38.119	27.357	35.256							
		7.219	5.081	6.144	6.294	6.351	5.711							
DOG3	97	32.297	26.703	36.821	35.649	25.778	34.652	63	32.738	24.803	37.032	35.721	26.085	33.847
		7.409	6.207	4.704	5.460	6.822	6.124		7.510	6.041	5.364	5.478	5.443	6.472
DYO	169	34.819	25.598	38.568	37.889	26.197	35.732	57	35.579	25.228	38.632	37.073	27.173	36.149
		6.798	6.003	5.080	5.156	6.010	5.950		6.225	5.979	5.317	5.120	5.530	6.185
EFE2	82	34.255	24.582	33.296	31.939	24.951	35.000							
		6.337	5.480	5.797	6.312	5.370	5.111							
FAL1	78	34.803	27.043	36.256	35.080	27.197	34.733	52	32.943	26.745	37.962	36.667	27.102	33.571
		6.122	5.982	4.613	4.635	6.124	5.433		6.646	5.429	5.545	5.098	5.428	6.298
FAL2	54	34.360	25.520	38.648	37.444	26.745	33.723	28	35.321	25.214	38.036	37.036	24.750	35.231
		5.213	6.855	4.853	4.928	6.302	5.613		6.673	6.033	4.910	4.910	5.948	7.290
FAL3	68	31.127	24.439	35.809	34.877	25.098	32.833							
		6.812	6.400	4.317	4.133	5.784	7.669							
FOU	73	33.714	27.264	39.082	38.722	27.507	35.547	36	35.222	26.286	37.743	37.722	25.417	36.314
		7.217	5.756	5.612	5.979	5.569	6.602		6.114	5.919	5.716	4.737	5.823	5.444
FUL	55	34.333	24.259	37.327	37.093	25.848	35.604							
		6.354	5.450	5.894	7.454	5.465	5.760							
GIN	93	35.204	28.753	39.183	38.710	28.925	36.075	94	36.043	26.511	39.340	38.138	26.851	36.436
		6.111	6.181	4.991	5.356	6.142	5.859		6.970	5.724	5.102	4.588	6.030	5.882
HEH	110	36.651	28.936	38.844	38.100	28.173	36.303	90	36.367	28.644	38.856	38.178	28.764	36.544
		6.007	5.687	6.323	5.593	5.565	5.094		5.838	4.844	5.276	5.552	4.805	5.426
KUR	116	33.842	25.370	38.086	37.288	25.560	34.753	132	34.248	25.626	37.939	37.116	25.639	34.461
		7.819	6.105	4.717	5.353	6.312	6.489		8.059	6.286	5.528	5.467	6.582	6.750
KUS	48	33.085	25.872	38.745	38.708	24.930	35.159							
		6.473	6.198	5.135	5.668	6.734	5.025							
LES	47	35.784	28.919	37.811	36.191	27.370	35.413	31	35.348	25.000	38.167	35.968	26.581	36.097
		6.481	5.550	5.332	5.515	4.706	6.882		7.389	5.090	5.851	5.624	5.755	7.115
LUI	89	36.124	27.775	39.607	39.640	28.820	36.101	75	36.707	28.880	40.653	39.400	29.093	36.893
		5.939	6.060	5.424	5.333	6.112	5.607		6.038	5.258	4.721	4.472	4.919	5.634

B-5. Continued.

	MALES							FEMALES						
GROUP	N	LC-D	LB-C	LA-B	RA-B	RB-C	RC-D	N	LC-D	LB-C	LA-B	RA-B	RB-C	RC-D
MAL								21	37.048	27.619	37.762	35.714	30.000	38.000
									7.138	6.399	4.460	5.533	6.148	4.561
MAM	95	33.361	27.885	37.863	36.930	27.880	34.410	73	33.300	28.817	37.945	37.239	27.361	35.317
		6.880	6.597	5.441	5.502	6.869	6.563		7.771	5.763	5.845	6.284	5.947	7.714
MAN	29	34.897	27.414	37.448	36.483	28.276	36.310							
		7.163	7.317	4.548	4.911	7.064	6.698							
MER	31	33.065	24.968	38.806	39.345	24.071	34.607	54	35.019	25.151	39.463	38.685	26.840	35.647
		7.312	5.193	5.612	5.627	5.564	7.913		6.500	5.806	6.480	5.538	4.821	6.876
NDB	21	36.905	26.952	36.857	35.857	26.905	38.143	43	35.721	26.953	37.860	37.535	27.140	37.419
		4.979	4.695	3.838	3.454	3.727	4.693		6.562	6.187	4.668	5.378	6.461	5.704
PED	83	36.145	27.554	38.940	38.084	27.518	37.072	92	37.696	28.207	40.424	39.076	28.533	38.239
		6.167	6.445	5.209	6.200	6.139	4.700		5.942	5.263	5.624	4.875	5.383	5.464
SAS	108	33.557	25.664	37.785	37.333	26.028	33.643	93	34.236	26.075	39.839	38.500	25.624	35.098
		7.932	6.821	5.249	5.903	7.113	7.234		7.047	6.759	4.712	5.305	6.895	6.389
SDN	34	35.258	27.909	38.735	38.167	27.613	36.645	22	36.263	27.950	39.476	37.273	28.545	38.318
		8.884	5.603	5.446	4.969	5.719	5.936		6.822	5.316	4.045	4.431	5.387	5.463
SHA	93	36.419	27.935	39.161	38.817	28.333	37.720	90	36.867	28.167	39.022	37.867	28.667	36.578
		6.138	5.608	5.313	5.279	5.438	4.944		6.049	5.969	5.255	5.254	5.860	6.000
SUK	54	35.037	26.963	38.370	36.981	27.111	36.407							
		6.134	5.481	3.743	4.214	5.168	4.993							
TAN	47	35.467	26.435	39.340	38.818	26.500	36.244							
		6.298	5.564	5.414	5.164	6.603	5.851							
TSW	92	37.370	29.033	38.685	38.130	29.652	38.283	88	36.489	26.045	38.614	37.750	25.602	37.193
		5.016	5.017	5.032	5.518	5.660	5.095		6.295	5.667	5.214	4.457	5.605	5.047
VEN	66	36.894	27.530	39.076	38.076	28.061	37.955	65	37.323	27.708	39.908	39.646	29.015	37.646
		6.107	6.512	5.272	5.009	6.800	5.319		7.461	5.297	4.844	5.349	5.198	6.040
YOR	122	34.570	26.529	38.083	37.098	26.320	36.082	54	37.630	26.963	38.944	37.778	27.481	36.741
		7.059	6.456	5.823	5.942	6.214	5.830		5.096	5.039	5.286	7.650	5.866	6.334

B-6. Male Finger Pattern Frequencies for Each Group Used in this Study.

	LEFT					RIGHT				
	I	II	III	IV	V	I	II	III	IV	V
AKA										
Arches	0.154	0.183	0.155	0.087	0.038	0.095	0.190	0.105	0.086	0.038
Radial	0.000	0.115	0.000	0.010	0.000	0.010	0.057	0.000	0.000	0.000
Ulnar	0.567	0.490	0.718	0.654	0.846	0.638	0.571	0.800	0.676	0.810
Whorls	0.279	0.212	0.126	0.250	0.115	0.257	0.181	0.095	0.238	0.152
AOY										
Arches	0.048	0.048	0.024	0.000	0.000	0.048	0.048	0.000	0.000	0.000
Radial	0.000	0.143	0.024	0.000	0.000	0.024	0.167	0.024	0.000	0.000
Ulnar	0.357	0.405	0.619	0.381	0.786	0.262	0.405	0.690	0.357	0.762
Whorls	0.595	0.405	0.333	0.619	0.214	0.667	0.381	0.286	0.643	0.238
ASY										
Arches	0.043	0.022	0.000	0.000	0.000	0.043	0.065	0.022	0.000	0.000
Radial	0.000	0.109	0.022	0.000	0.000	0.000	0.261	0.022	0.000	0.022
Ulnar	0.261	0.391	0.565	0.457	0.804	0.174	0.283	0.630	0.348	0.717
Whorls	0.696	0.478	0.413	0.543	0.196	0.783	0.391	0.326	0.652	0.261
BAB										
Arches	0.061	0.069	0.046	0.023	0.012	0.051	0.080	0.045	0.006	0.023
Radial	0.022	0.092	0.011	0.006	0.000	0.000	0.057	0.000	0.006	0.000
Ulnar	0.346	0.457	0.600	0.580	0.806	0.354	0.489	0.697	0.559	0.805
Whorls	0.570	0.382	0.343	0.392	0.182	0.594	0.375	0.258	0.429	0.172
BAG										
Arches	0.129	0.109	0.099	0.030	0.030	0.059	0.079	0.059	0.030	0.010
Radial	0.010	0.040	0.010	0.000	0.000	0.010	0.050	0.010	0.000	0.000
Ulnar	0.455	0.515	0.752	0.653	0.861	0.525	0.465	0.743	0.584	0.842
Whorls	0.406	0.337	0.139	0.317	0.109	0.406	0.406	0.188	0.386	0.149
BAK										
Arches	0.043	0.094	0.100	0.028	0.014	0.036	0.050	0.049	0.021	0.014
Radial	0.000	0.094	0.014	0.000	0.000	0.007	0.086	0.035	0.000	0.000
Ulnar	0.340	0.348	0.607	0.606	0.816	0.250	0.381	0.632	0.524	0.836
Whorls	0.617	0.464	0.279	0.366	0.170	0.707	0.482	0.285	0.455	0.150
BAM										
Arches	0.197	0.108	0.107	0.019	0.019	0.086	0.092	0.085	0.028	0.019
Radial	0.000	0.118	0.000	0.009	0.000	0.000	0.082	0.000	0.000	0.010
Ulnar	0.451	0.422	0.631	0.594	0.804	0.569	0.490	0.698	0.566	0.769
Whorls	0.352	0.353	0.252	0.377	0.178	0.345	0.337	0.217	0.406	0.202

B-6. Continued.

	LEFT					RIGHT				
	I	II	III	IV	V	I	II	III	IV	V
BAO										
Arches	0.120	0.102	0.092	0.035	0.014	0.099	0.092	0.060	0.014	0.014
Radial	0.004	0.060	0.000	0.000	0.000	0.011	0.074	0.011	0.007	0.000
Ulnar	0.484	0.495	0.676	0.641	0.908	0.405	0.461	0.694	0.567	0.859
Whorls	0.392	0.343	0.232	0.324	0.077	0.486	0.373	0.236	0.412	0.127
BAS										
Arches	0.091	0.182	0.136	0.091	0.045	0.091	0.182	0.182	0.000	0.000
Radial	0.045	0.182	0.000	0.091	0.000	0.000	0.045	0.000	0.045	0.000
Ulnar	0.773	0.545	0.818	0.636	0.864	0.636	0.545	0.727	0.727	0.864
Whorls	0.091	0.091	0.045	0.182	0.091	0.273	0.227	0.091	0.227	0.136
BEO										
Arches	0.064	0.021	0.000	0.000	0.000	0.021	0.021	0.000	0.000	0.000
Radial	0.000	0.149	0.000	0.000	0.000	0.000	0.042	0.021	0.000	0.042
Ulnar	0.426	0.383	0.702	0.489	0.596	0.354	0.375	0.688	0.271	0.646
Whorls	0.511	0.447	0.298	0.511	0.404	0.625	0.563	0.292	0.729	0.313
BIE										
Arches	0.056	0.125	0.056	0.000	0.000	0.069	0.097	0.042	0.000	0.014
Radial	0.014	0.083	0.000	0.000	0.014	0.000	0.069	0.014	0.000	0.000
Ulnar	0.486	0.528	0.722	0.611	0.819	0.431	0.542	0.722	0.542	0.833
Whorls	0.444	0.264	0.222	0.389	0.167	0.500	0.292	0.222	0.458	0.153
BKO										
Arches	0.062	0.119	0.094	0.031	0.023	0.047	0.094	0.085	0.031	0.024
Radial	0.000	0.063	0.008	0.000	0.000	0.000	0.055	0.000	0.000	0.000
Ulnar	0.338	0.468	0.625	0.515	0.775	0.297	0.472	0.705	0.516	0.794
Whorls	0.600	0.349	0.273	0.454	0.202	0.656	0.378	0.209	0.453	0.183
BOZ										
Arches	0.083	0.137	0.076	0.023	0.023	0.045	0.109	0.069	0.023	0.015
Radial	0.008	0.031	0.000	0.015	0.000	0.000	0.078	0.008	0.008	0.008
Ulnar	0.561	0.527	0.705	0.608	0.831	0.462	0.558	0.779	0.500	0.809
Whorls	0.348	0.305	0.220	0.354	0.146	0.492	0.256	0.145	0.470	0.168
BUS										
Arches	0.218	0.205	0.218	0.077	0.177	0.154	0.205	0.127	0.038	0.063
Radial	0.000	0.205	0.013	0.013	0.000	0.013	0.269	0.000	0.000	0.000
Ulnar	0.603	0.397	0.679	0.885	0.823	0.436	0.346	0.772	0.795	0.924
Whorls	0.179	0.192	0.090	0.013	0.000	0.397	0.179	0.101	0.167	0.013

B-6. Continued.

	LEFT I	LEFT II	LEFT III	LEFT IV	LEFT V	RIGHT I	RIGHT II	RIGHT III	RIGHT IV	RIGHT V
CHO										
Arches	0.075	0.086	0.043	0.022	0.011	0.022	0.065	0.043	0.011	0.022
Radial	0.000	0.086	0.000	0.000	0.000	0.000	0.075	0.000	0.011	0.000
Ulnar	0.387	0.527	0.710	0.581	0.839	0.424	0.570	0.763	0.602	0.796
Whorls	0.538	0.301	0.247	0.398	0.151	0.554	0.290	0.183	0.366	0.172
CUA										
Arches	0.080	0.106	0.060	0.000	0.009	0.082	0.052	0.034	0.000	0.009
Radial	0.000	0.044	0.000	0.009	0.009	0.000	0.078	0.017	0.000	0.000
Ulnar	0.522	0.619	0.784	0.684	0.878	0.509	0.565	0.741	0.591	0.853
Whorls	0.398	0.230	0.155	0.307	0.104	0.409	0.304	0.207	0.409	0.138
DOG1										
Arches	0.200	0.040	0.060	0.000	0.000	0.170	0.082	0.080	0.000	0.000
Radial	0.000	0.100	0.000	0.000	0.000	0.043	0.061	0.000	0.000	0.000
Ulnar	0.520	0.600	0.820	0.760	0.900	0.319	0.551	0.760	0.620	0.920
Whorls	0.280	0.260	0.120	0.240	0.100	0.468	0.306	0.160	0.380	0.080
DOG2										
Arches	0.165	0.076	0.051	0.025	0.000	0.103	0.095	0.051	0.019	0.019
Radial	0.000	0.064	0.000	0.000	0.000	0.019	0.057	0.000	0.000	0.000
Ulnar	0.418	0.573	0.739	0.535	0.873	0.361	0.506	0.752	0.462	0.809
Whorls	0.418	0.287	0.210	0.439	0.127	0.516	0.342	0.197	0.519	0.172
DYO										
Arches	0.091	0.103	0.117	0.032	0.011	0.092	0.136	0.097	0.021	0.005
Radial	0.000	0.108	0.005	0.005	0.000	0.000	0.054	0.011	0.005	0.000
Ulnar	0.422	0.514	0.707	0.612	0.861	0.400	0.473	0.694	0.529	0.856
Whorls	0.487	0.276	0.170	0.351	0.128	0.508	0.337	0.199	0.444	0.139
EFE										
Arches	0.216	0.209	0.181	0.129	0.096	0.149	0.133	0.158	0.061	0.070
Radial	0.009	0.122	0.009	0.009	0.009	0.000	0.044	0.000	0.026	0.000
Ulnar	0.491	0.478	0.707	0.629	0.789	0.491	0.584	0.789	0.626	0.739
Whorls	0.284	0.191	0.103	0.233	0.105	0.360	0.239	0.053	0.287	0.191
EFE2										
Arches	0.179	0.202	0.200	0.131	0.094	0.157	0.167	0.165	0.071	0.082
Radial	0.000	0.131	0.024	0.024	0.024	0.000	0.119	0.000	0.024	0.000
Ulnar	0.619	0.464	0.612	0.655	0.788	0.614	0.500	0.706	0.635	0.753
Whorls	0.202	0.202	0.165	0.190	0.094	0.229	0.214	0.129	0.271	0.165

B-6. Continued.

	LEFT					RIGHT				
	I	II	III	IV	V	I	II	III	IV	V
FAL1										
Arches	0.111	0.100	0.087	0.022	0.000	0.055	0.098	0.087	0.011	0.000
Radial	0.000	0.044	0.000	0.011	0.000	0.000	0.000	0.000	0.000	0.000
Ulnar	0.344	0.367	0.554	0.424	0.835	0.396	0.457	0.641	0.495	0.791
Whorls	0.544	0.489	0.359	0.543	0.165	0.549	0.446	0.272	0.495	0.209
FAL2										
Arches	0.055	0.073	0.093	0.000	0.018	0.036	0.036	0.055	0.018	0.018
Radial	0.000	0.091	0.000	0.036	0.018	0.000	0.036	0.018	0.000	0.000
Ulnar	0.418	0.473	0.648	0.545	0.836	0.382	0.582	0.673	0.455	0.818
Whorls	0.527	0.364	0.259	0.418	0.127	0.582	0.345	0.255	0.527	0.164
FAL3										
Arches	0.057	0.103	0.143	0.057	0.057	0.057	0.100	0.143	0.057	0.029
Radial	0.000	0.029	0.000	0.014	0.000	0.000	0.057	0.014	0.014	0.000
Ulnar	0.429	0.529	0.671	0.414	0.786	0.343	0.557	0.571	0.329	0.739
Whorls	0.514	0.338	0.186	0.514	0.157	0.600	0.286	0.271	0.600	0.232
FOU										
Arches	0.092	0.171	0.090	0.013	0.013	0.013	0.103	0.115	0.026	0.000
Radial	0.000	0.053	0.026	0.000	0.000	0.000	0.064	0.013	0.000	0.000
Ulnar	0.355	0.342	0.628	0.564	0.885	0.325	0.410	0.667	0.468	0.870
Whorls	0.553	0.434	0.256	0.423	0.103	0.662	0.423	0.205	0.506	0.130
FUL										
Arches	0.143	0.055	0.161	0.036	0.018	0.107	0.111	0.107	0.036	0.036
Radial	0.000	0.109	0.000	0.018	0.000	0.000	0.037	0.036	0.000	0.000
Ulnar	0.411	0.400	0.429	0.518	0.800	0.411	0.333	0.589	0.482	0.786
Whorls	0.446	0.436	0.411	0.429	0.182	0.482	0.519	0.268	0.482	0.179
GIN										
Arches	0.064	0.096	0.053	0.032	0.011	0.043	0.106	0.021	0.011	0.011
Radial	0.000	0.106	0.011	0.000	0.000	0.000	0.085	0.021	0.000	0.000
Ulnar	0.574	0.543	0.734	0.660	0.872	0.500	0.468	0.777	0.564	0.840
Whorls	0.362	0.245	0.191	0.309	0.117	0.457	0.340	0.181	0.426	0.149
HEH										
Arches	0.083	0.119	0.092	0.046	0.046	0.055	0.082	0.073	0.028	0.037
Radial	0.000	0.064	0.000	0.000	0.000	0.000	0.036	0.000	0.000	0.000
Ulnar	0.450	0.431	0.661	0.661	0.807	0.404	0.500	0.745	0.606	0.835
Whorls	0.468	0.385	0.248	0.294	0.147	0.541	0.382	0.182	0.367	0.128

B-6. Continued.

	LEFT					RIGHT				
	I	II	III	IV	V	I	II	III	IV	V
KIR										
Arches	0.104	0.055	0.074	0.019	0.009	0.076	0.065	0.064	0.018	0.019
Radial	0.000	0.064	0.000	0.000	0.000	0.000	0.065	0.009	0.009	0.000
Ulnar	0.500	0.514	0.741	0.602	0.881	0.448	0.519	0.743	0.569	0.815
Whorls	0.396	0.367	0.185	0.380	0.110	0.476	0.352	0.183	0.404	0.167
KUR										
Arches	0.146	0.139	0.065	0.050	0.029	0.087	0.081	0.065	0.029	0.036
Radial	0.007	0.080	0.014	0.000	0.000	0.007	0.096	0.014	0.000	0.000
Ulnar	0.474	0.409	0.698	0.619	0.884	0.464	0.471	0.683	0.554	0.862
Whorls	0.372	0.372	0.223	0.331	0.087	0.442	0.353	0.237	0.417	0.101
KUS										
Arches	0.146	0.083	0.125	0.063	0.021	0.167	0.128	0.104	0.043	0.021
Radial	0.042	0.063	0.000	0.000	0.000	0.042	0.043	0.000	0.000	0.000
Ulnar	0.479	0.542	0.646	0.438	0.875	0.354	0.447	0.708	0.468	0.792
Whorls	0.333	0.313	0.229	0.500	0.104	0.438	0.383	0.188	0.489	0.188
LES										
Arches	0.070	0.140	0.088	0.035	0.070	0.071	0.089	0.054	0.018	0.018
Radial	0.000	0.123	0.000	0.000	0.000	0.000	0.107	0.000	0.018	0.000
Ulnar	0.561	0.509	0.737	0.737	0.842	0.571	0.589	0.875	0.750	0.912
Whorls	0.368	0.228	0.175	0.228	0.088	0.357	0.214	0.071	0.214	0.070
LUI										
Arches	0.056	0.101	0.056	0.045	0.022	0.045	0.146	0.034	0.011	0.022
Radial	0.000	0.090	0.000	0.000	0.000	0.000	0.056	0.000	0.000	0.000
Ulnar	0.517	0.539	0.787	0.573	0.831	0.528	0.494	0.820	0.506	0.809
Whorls	0.427	0.270	0.157	0.382	0.146	0.427	0.303	0.146	0.483	0.169
MAM										
Arches	0.057	0.026	0.026	0.000	0.000	0.038	0.026	0.009	0.000	0.000
Radial	0.000	0.070	0.009	0.000	0.009	0.000	0.061	0.009	0.000	0.000
Ulnar	0.387	0.526	0.702	0.591	0.896	0.292	0.522	0.696	0.548	0.896
Whorls	0.557	0.377	0.263	0.409	0.096	0.670	0.391	0.287	0.452	0.104
MAN										
Arches	0.034	0.069	0.034	0.000	0.000	0.103	0.034	0.034	0.000	0.000
Radial	0.000	0.276	0.000	0.000	0.000	0.000	0.034	0.000	0.000	0.000
Ulnar	0.517	0.345	0.724	0.621	0.966	0.414	0.655	0.828	0.655	0.897
Whorls	0.448	0.310	0.241	0.379	0.034	0.483	0.276	0.138	0.345	0.103

B-6. Continued.

	LEFT					RIGHT				
	I	II	III	IV	V	I	II	III	IV	V
MER										
Arches	0.000	0.029	0.000	0.000	0.000	0.029	0.057	0.000	0.000	0.000
Radial	0.000	0.114	0.029	0.000	0.000	0.000	0.143	0.000	0.000	0.000
Ulnar	0.600	0.457	0.743	0.571	0.800	0.457	0.343	0.743	0.457	0.714
Whorls	0.400	0.400	0.229	0.429	0.200	0.514	0.457	0.257	0.543	0.286
NDB										
Arches	0.190	0.190	0.143	0.000	0.048	0.238	0.095	0.000	0.000	0.048
Radial	0.000	0.143	0.000	0.000	0.000	0.000	0.095	0.000	0.000	0.000
Ulnar	0.476	0.476	0.714	0.667	0.905	0.381	0.571	0.810	0.571	0.810
Whorls	0.333	0.190	0.143	0.333	0.048	0.381	0.238	0.190	0.429	0.143
PED										
Arches	0.106	0.153	0.106	0.035	0.047	0.059	0.106	0.071	0.024	0.012
Radial	0.000	0.059	0.000	0.000	0.012	0.000	0.035	0.012	0.012	0.000
Ulnar	0.506	0.494	0.729	0.588	0.800	0.506	0.588	0.812	0.612	0.859
Whorls	0.388	0.294	0.165	0.376	0.141	0.435	0.271	0.106	0.353	0.129
SAS										
Arches	0.214	0.173	0.125	0.036	0.018	0.134	0.134	0.090	0.018	0.009
Radial	0.000	0.073	0.000	0.000	0.000	0.009	0.027	0.000	0.009	0.000
Ulnar	0.473	0.527	0.696	0.580	0.884	0.438	0.545	0.766	0.509	0.920
Whorls	0.313	0.227	0.179	0.384	0.098	0.420	0.295	0.144	0.464	0.071
SDN										
Arches	0.029	0.029	0.000	0.029	0.000	0.029	0.088	0.029	0.000	0.029
Radial	0.000	0.029	0.000	0.000	0.000	0.000	0.059	0.000	0.029	0.029
Ulnar	0.353	0.647	0.824	0.529	0.882	0.265	0.529	0.824	0.441	0.765
Whorls	0.618	0.294	0.176	0.441	0.118	0.706	0.324	0.147	0.529	0.176
SHA										
Arches	0.130	0.130	0.130	0.065	0.022	0.098	0.141	0.065	0.033	0.022
Radial	0.033	0.065	0.022	0.000	0.000	0.011	0.043	0.000	0.022	0.000
Ulnar	0.457	0.489	0.674	0.641	0.870	0.467	0.435	0.750	0.587	0.870
Whorls	0.380	0.315	0.174	0.293	0.109	0.424	0.380	0.185	0.359	0.109
SUK										
Arches	0.074	0.185	0.093	0.019	0.019	0.037	0.093	0.037	0.000	0.019
Radial	0.000	0.148	0.019	0.019	0.019	0.019	0.056	0.019	0.000	0.000
Ulnar	0.500	0.370	0.741	0.593	0.889	0.519	0.593	0.778	0.648	0.926
Whorls	0.426	0.296	0.148	0.370	0.074	0.426	0.259	0.167	0.352	0.056

B-6. Continued.

	LEFT					RIGHT				
	I	II	III	IV	V	I	II	III	IV	V
TAN										
Arches	0.063	0.063	0.042	0.000	0.021	0.042	0.021	0.021	0.000	0.000
Radial	0.000	0.083	0.000	0.000	0.000	0.000	0.104	0.021	0.000	0.000
Ulnar	0.500	0.458	0.625	0.500	0.813	0.479	0.438	0.604	0.375	0.787
Whorls	0.438	0.396	0.333	0.500	0.167	0.479	0.438	0.354	0.625	0.213
TSW										
Arches	0.120	0.087	0.033	0.022	0.033	0.098	0.065	0.022	0.011	0.011
Radial	0.011	0.087	0.000	0.000	0.000	0.000	0.130	0.000	0.022	0.000
Ulnar	0.467	0.489	0.728	0.609	0.870	0.413	0.457	0.696	0.565	0.793
Whorls	0.402	0.337	0.239	0.370	0.098	0.489	0.348	0.283	0.402	0.196
VEN										
Arches	0.091	0.061	0.076	0.000	0.015	0.061	0.045	0.030	0.000	0.015
Radial	0.015	0.061	0.000	0.015	0.000	0.015	0.091	0.030	0.015	0.030
Ulnar	0.485	0.364	0.591	0.606	0.955	0.500	0.348	0.606	0.424	0.894
Whorls	0.409	0.515	0.333	0.379	0.030	0.424	0.515	0.333	0.561	0.061
YOR										
Arches	0.092	0.133	0.083	0.025	0.000	0.067	0.092	0.067	0.017	0.000
Radial	0.008	0.092	0.000	0.017	0.000	0.000	0.125	0.025	0.000	0.000
Ulnar	0.433	0.442	0.633	0.567	0.900	0.417	0.442	0.667	0.483	0.908
Whorls	0.467	0.333	0.283	0.392	0.100	0.517	0.342	0.233	0.500	0.092

B-7. Female Finger Pattern Frequencies for Each Group Used in this Study.

	LEFT					RIGHT				
	I	II	III	IV	V	I	II	III	IV	V
AKA										
Arches	0.156	0.267	0.178	0.111	0.078	0.144	0.178	0.100	0.078	0.033
Radial	0.000	0.111	0.011	0.022	0.000	0.000	0.033	0.000	0.000	0.011
Ulnar	0.456	0.433	0.733	0.678	0.789	0.578	0.667	0.856	0.678	0.867
Whorls	0.389	0.189	0.078	0.189	0.133	0.278	0.122	0.044	0.244	0.089
BAB										
Arches	0.090	0.118	0.096	0.049	0.042	0.110	0.085	0.090	0.035	0.007
Radial	0.028	0.063	0.014	0.000	0.000	0.028	0.028	0.007	0.000	0.000
Ulnar	0.262	0.472	0.658	0.569	0.796	0.297	0.574	0.731	0.583	0.813
Whorls	0.621	0.347	0.233	0.382	0.162	0.566	0.312	0.172	0.382	0.180
BAG										
Arches	0.108	0.108	0.149	0.027	0.014	0.068	0.068	0.081	0.014	0.027
Radial	0.014	0.068	0.000	0.000	0.000	0.027	0.095	0.000	0.000	0.000
Ulnar	0.419	0.514	0.676	0.595	0.904	0.459	0.500	0.797	0.581	0.851
Whorls	0.459	0.311	0.176	0.378	0.082	0.446	0.338	0.122	0.405	0.122
BAK										
Arches	0.096	0.096	0.135	0.053	0.026	0.035	0.091	0.079	0.027	0.035
Radial	0.000	0.096	0.018	0.000	0.000	0.009	0.055	0.009	0.000	0.000
Ulnar	0.254	0.333	0.577	0.614	0.825	0.287	0.373	0.640	0.566	0.798
Whorls	0.649	0.474	0.270	0.333	0.149	0.670	0.482	0.272	0.407	0.167
BAM										
Arches	0.143	0.175	0.151	0.066	0.029	0.115	0.167	0.095	0.019	0.000
Radial	0.000	0.107	0.038	0.000	0.000	0.000	0.088	0.000	0.000	0.000
Ulnar	0.397	0.388	0.613	0.623	0.856	0.500	0.412	0.752	0.651	0.883
Whorls	0.460	0.330	0.198	0.311	0.115	0.385	0.333	0.152	0.330	0.117
BAO										
Arches	0.157	0.111	0.135	0.063	0.031	0.142	0.119	0.111	0.047	0.024
Radial	0.000	0.040	0.016	0.008	0.000	0.008	0.032	0.000	0.008	0.000
Ulnar	0.472	0.619	0.667	0.638	0.866	0.457	0.556	0.762	0.543	0.913
Whorls	0.370	0.230	0.183	0.291	0.102	0.394	0.294	0.127	0.402	0.063
BAS										
Arches	0.146	0.176	0.216	0.088	0.078	0.107	0.118	0.078	0.029	0.039
Radial	0.000	0.167	0.000	0.020	0.000	0.000	0.049	0.010	0.019	0.000
Ulnar	0.447	0.490	0.686	0.569	0.796	0.602	0.637	0.874	0.670	0.854
Whorls	0.408	0.167	0.098	0.324	0.126	0.291	0.196	0.039	0.282	0.107

B-7. Continued.

	LEFT					RIGHT				
	I	II	III	IV	V	I	II	III	IV	V
BIE										
Arches	0.082	0.151	0.068	0.014	0.000	0.055	0.110	0.068	0.000	0.014
Radial	0.000	0.137	0.000	0.027	0.014	0.014	0.082	0.000	0.000	0.000
Ulnar	0.466	0.479	0.808	0.712	0.890	0.479	0.644	0.849	0.753	0.918
Whorls	0.452	0.233	0.123	0.247	0.096	0.452	0.164	0.082	0.247	0.068
BKO										
Arches	0.039	0.079	0.118	0.039	0.039	0.049	0.088	0.108	0.029	0.029
Radial	0.000	0.119	0.000	0.010	0.000	0.000	0.059	0.000	0.000	0.000
Ulnar	0.223	0.455	0.647	0.598	0.755	0.262	0.549	0.657	0.598	0.784
Whorls	0.738	0.347	0.235	0.353	0.206	0.689	0.304	0.235	0.373	0.186
BUS										
Arches	0.310	0.244	0.262	0.143	0.238	0.195	0.238	0.167	0.095	0.190
Radial	0.000	0.171	0.000	0.000	0.000	0.000	0.238	0.000	0.000	0.000
Ulnar	0.476	0.293	0.667	0.762	0.762	0.390	0.310	0.690	0.690	0.810
Whorls	0.214	0.293	0.071	0.095	0.000	0.415	0.214	0.143	0.214	0.000
CHO										
Arches	0.066	0.121	0.077	0.022	0.022	0.077	0.088	0.011	0.011	0.000
Radial	0.011	0.033	0.000	0.011	0.011	0.000	0.055	0.000	0.000	0.000
Ulnar	0.418	0.582	0.714	0.604	0.802	0.429	0.681	0.857	0.670	0.857
Whorls	0.495	0.264	0.209	0.363	0.165	0.495	0.176	0.132	0.319	0.143
CUA										
Arches	0.111	0.189	0.074	0.032	0.064	0.098	0.138	0.084	0.053	0.076
Radial	0.000	0.042	0.011	0.000	0.000	0.000	0.021	0.000	0.000	0.000
Ulnar	0.533	0.505	0.779	0.755	0.862	0.554	0.521	0.789	0.684	0.891
Whorls	0.356	0.263	0.137	0.213	0.074	0.348	0.319	0.126	0.263	0.033
DOG2										
Arches	0.170	0.124	0.104	0.057	0.038	0.152	0.125	0.096	0.057	0.019
Radial	0.019	0.105	0.009	0.000	0.000	0.010	0.077	0.000	0.000	0.000
Ulnar	0.377	0.467	0.660	0.581	0.821	0.371	0.462	0.702	0.476	0.848
Whorls	0.434	0.305	0.226	0.362	0.142	0.467	0.337	0.202	0.467	0.133
DYO										
Arches	0.131	0.164	0.131	0.049	0.049	0.100	0.115	0.098	0.016	0.000
Radial	0.000	0.115	0.016	0.000	0.000	0.000	0.115	0.000	0.000	0.000
Ulnar	0.377	0.426	0.787	0.590	0.803	0.417	0.475	0.770	0.525	0.852
Whorls	0.492	0.295	0.066	0.361	0.148	0.483	0.295	0.131	0.459	0.148

B-7. Continued.

	LEFT					RIGHT				
	I	II	III	IV	V	I	II	III	IV	V
EFE										
Arches	0.192	0.241	0.259	0.074	0.113	0.167	0.148	0.157	0.075	0.074
Radial	0.000	0.111	0.019	0.019	0.019	0.000	0.019	0.000	0.000	0.000
Ulnar	0.423	0.426	0.593	0.611	0.698	0.519	0.611	0.784	0.679	0.833
Whorls	0.385	0.222	0.130	0.296	0.170	0.315	0.222	0.059	0.245	0.093
EFE2										
Arches	0.265	0.273	0.235	0.147	0.152	0.182	0.152	0.152	0.091	0.182
Radial	0.000	0.091	0.000	0.000	0.000	0.000	0.061	0.000	0.030	0.030
Ulnar	0.618	0.606	0.618	0.676	0.788	0.576	0.667	0.788	0.545	0.727
Whorls	0.118	0.030	0.147	0.176	0.061	0.242	0.121	0.061	0.333	0.061
FAL1										
Arches	0.088	0.054	0.089	0.018	0.035	0.123	0.088	0.035	0.000	0.035
Radial	0.018	0.071	0.000	0.000	0.000	0.000	0.018	0.000	0.000	0.000
Ulnar	0.228	0.429	0.607	0.455	0.754	0.298	0.544	0.754	0.582	0.807
Whorls	0.667	0.446	0.304	0.527	0.211	0.579	0.351	0.211	0.418	0.158
FAL2										
Arches	0.179	0.036	0.071	0.071	0.000	0.214	0.074	0.036	0.036	0.000
Radial	0.000	0.071	0.036	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ulnar	0.357	0.500	0.607	0.607	0.857	0.357	0.519	0.857	0.643	0.964
Whorls	0.464	0.393	0.286	0.321	0.143	0.429	0.407	0.107	0.321	0.036
FOU										
Arches	0.077	0.103	0.050	0.025	0.025	0.054	0.103	0.051	0.000	0.000
Radial	0.000	0.051	0.000	0.000	0.000	0.000	0.026	0.000	0.000	0.000
Ulnar	0.513	0.564	0.825	0.575	0.875	0.541	0.667	0.897	0.667	0.950
Whorls	0.410	0.282	0.125	0.400	0.100	0.405	0.205	0.051	0.333	0.050
GIN										
Arches	0.085	0.085	0.053	0.064	0.032	0.096	0.085	0.085	0.032	0.011
Radial	0.000	0.074	0.000	0.000	0.000	0.000	0.043	0.011	0.000	0.000
Ulnar	0.394	0.585	0.734	0.660	0.862	0.372	0.596	0.755	0.660	0.915
Whorls	0.521	0.255	0.213	0.277	0.106	0.532	0.277	0.149	0.309	0.074
HEH										
Arches	0.135	0.167	0.034	0.011	0.034	0.067	0.100	0.044	0.011	0.033
Radial	0.000	0.089	0.011	0.011	0.000	0.000	0.033	0.000	0.000	0.000
Ulnar	0.449	0.533	0.798	0.667	0.888	0.556	0.644	0.878	0.711	0.911
Whorls	0.416	0.211	0.157	0.311	0.079	0.378	0.222	0.078	0.278	0.056

B-7. Continued.

	LEFT					RIGHT				
	I	II	III	IV	V	I	II	III	IV	V
KIR										
Arches	0.132	0.028	0.127	0.042	0.014	0.130	0.043	0.042	0.014	0.014
Radial	0.000	0.056	0.000	0.000	0.000	0.014	0.057	0.000	0.014	0.000
Ulnar	0.471	0.620	0.676	0.648	0.887	0.406	0.571	0.775	0.648	0.943
Whorls	0.397	0.296	0.197	0.310	0.099	0.449	0.329	0.183	0.324	0.043
KUR										
Arches	0.193	0.165	0.136	0.043	0.043	0.174	0.140	0.094	0.029	0.029
Radial	0.021	0.065	0.007	0.000	0.007	0.007	0.044	0.007	0.007	0.000
Ulnar	0.336	0.496	0.707	0.621	0.893	0.384	0.522	0.784	0.614	0.907
Whorls	0.450	0.273	0.150	0.336	0.057	0.435	0.294	0.115	0.350	0.064
LES										
Arches	0.152	0.030	0.030	0.030	0.030	0.091	0.091	0.030	0.000	0.000
Radial	0.000	0.091	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ulnar	0.364	0.576	0.848	0.576	0.879	0.545	0.636	0.879	0.636	0.909
Whorls	0.485	0.303	0.121	0.394	0.091	0.364	0.273	0.091	0.364	0.091
LUI										
Arches	0.092	0.132	0.092	0.053	0.013	0.092	0.066	0.039	0.013	0.013
Radial	0.000	0.118	0.013	0.000	0.000	0.000	0.066	0.000	0.000	0.000
Ulnar	0.355	0.421	0.697	0.526	0.895	0.434	0.605	0.803	0.618	0.947
Whorls	0.553	0.329	0.197	0.421	0.092	0.474	0.263	0.158	0.368	0.039
MAM										
Arches	0.108	0.093	0.093	0.000	0.013	0.068	0.067	0.067	0.000	0.000
Radial	0.000	0.040	0.013	0.000	0.000	0.000	0.040	0.000	0.000	0.000
Ulnar	0.365	0.440	0.560	0.587	0.907	0.392	0.493	0.707	0.573	0.880
Whorls	0.527	0.427	0.333	0.413	0.080	0.541	0.400	0.227	0.427	0.120
MER										
Arches	0.063	0.079	0.016	0.016	0.000	0.016	0.048	0.016	0.016	0.000
Radial	0.000	0.048	0.000	0.016	0.016	0.016	0.032	0.000	0.000	0.000
Ulnar	0.476	0.381	0.683	0.508	0.714	0.429	0.444	0.746	0.381	0.730
Whorls	0.460	0.492	0.302	0.460	0.270	0.540	0.476	0.238	0.603	0.270
NOB										
Arches	0.209	0.093	0.070	0.070	0.093	0.163	0.070	0.047	0.023	0.047
Radial	0.000	0.047	0.000	0.000	0.000	0.000	0.047	0.000	0.023	0.000
Ulnar	0.372	0.488	0.767	0.628	0.814	0.442	0.465	0.744	0.581	0.860
Whorls	0.419	0.372	0.163	0.302	0.093	0.395	0.419	0.209	0.372	0.093

B-7. Continued.

	LEFT					RIGHT				
	I	II	III	IV	V	I	II	III	IV	V
PED										
Arches	0.185	0.152	0.130	0.033	0.033	0.174	0.130	0.087	0.054	0.022
Radial	0.000	0.109	0.022	0.000	0.000	0.000	0.076	0.011	0.011	0.011
Ulnar	0.380	0.511	0.674	0.696	0.870	0.424	0.543	0.783	0.620	0.935
Whorls	0.435	0.228	0.174	0.272	0.098	0.402	0.250	0.120	0.315	0.033
SAS										
Arches	0.179	0.105	0.074	0.021	0.032	0.179	0.053	0.063	0.021	0.042
Radial	0.011	0.053	0.011	0.000	0.000	0.000	0.042	0.000	0.000	0.000
Ulnar	0.474	0.547	0.789	0.632	0.863	0.516	0.674	0.842	0.653	0.863
Whorls	0.337	0.295	0.126	0.347	0.105	0.305	0.232	0.095	0.326	0.095
SDN										
Arches	0.000	0.091	0.045	0.000	0.000	0.045	0.045	0.000	0.000	0.000
Radial	0.000	0.045	0.000	0.000	0.000	0.000	0.045	0.000	0.000	0.000
Ulnar	0.455	0.636	0.682	0.545	0.864	0.409	0.545	0.864	0.571	0.864
Whorls	0.545	0.227	0.273	0.455	0.136	0.545	0.364	0.136	0.429	0.136
SHA										
Arches	0.133	0.122	0.111	0.056	0.033	0.056	0.111	0.078	0.033	0.011
Radial	0.000	0.111	0.000	0.000	0.011	0.000	0.033	0.000	0.000	0.000
Ulnar	0.456	0.400	0.722	0.633	0.878	0.600	0.533	0.822	0.667	0.922
Whorls	0.411	0.367	0.167	0.311	0.078	0.344	0.322	0.100	0.300	0.067
TSW										
Arches	0.250	0.170	0.125	0.091	0.102	0.193	0.159	0.091	0.057	0.068
Radial	0.000	0.057	0.000	0.034	0.000	0.000	0.034	0.000	0.000	0.000
Ulnar	0.432	0.591	0.693	0.591	0.818	0.534	0.557	0.807	0.602	0.864
Whorls	0.318	0.182	0.182	0.284	0.080	0.273	0.250	0.102	0.341	0.068
VEN										
Arches	0.106	0.136	0.121	0.000	0.000	0.076	0.091	0.045	0.000	0.015
Radial	0.015	0.121	0.015	0.030	0.000	0.000	0.061	0.015	0.015	0.000
Ulnar	0.485	0.424	0.652	0.652	0.909	0.500	0.576	0.833	0.712	0.939
Whorls	0.394	0.318	0.197	0.303	0.076	0.424	0.273	0.106	0.273	0.045
YOR										
Arches	0.182	0.182	0.091	0.036	0.036	0.109	0.073	0.055	0.018	0.018
Radial	0.018	0.055	0.000	0.000	0.000	0.000	0.055	0.000	0.000	0.000
Ulnar	0.509	0.436	0.709	0.709	0.836	0.564	0.564	0.782	0.709	0.855
Whorls	0.291	0.327	0.200	0.255	0.127	0.327	0.309	0.164	0.273	0.127

B-8. Male Palmar Pattern Frequencies of Each Group Used in this Study, Section 1.

	LEFT										
	HYPOTHENAR			THENAR		II	III		IV		
TRIBE	O	O/O	Lr	O	O/O	O	O	L	O	L	D
AKA	.21	.543	.19	.533	.229	.895	.714	.21	.086	.486	.21
AOY	.61	.244	.073	.81	.095	.952	.857	.095	.095	.524	.286
ASY	.267	.467	.177	.804	.065	.957	.783	.109	.109	.587	.239
BAG	.327	.505	.1	.634	.099	.871	.822	.129	.119	.436	.188
BAK	.624	.135	.158	.655	.228	.907	.835	.104	.159	.363	.239
BAM	.452	.298	.202	.828	.114	.907	.721	.198	.209	.36	.267
BAO	.463	.282	.162	.714	.149	.881	.815	.137	.207	.366	.233
BAS	.286	.333	.238	.333	.334	.857	.524	.476	.143	.286	.286
BEO	.532	.277	.106	.851	.021	1	.936	.043	.149	.638	.064
BIE	.389	.333	.195	.736	.126	.931	.722	.181	.125	.333	.278
BOZ	.474	.308	.174	.699	.174	.887	.809	.13	.186	.481	.147
BUS	.62	.228	.139	.595	.115	.848	.684	.203	.266	.354	.165
BWA	.553	.23	.132	.618	.151	.879	.75	.177	.074	.46	.331
CHO	.366	.258	.259	.71	.162	.903	.796	.14	.14	.452	.247
CUA	.514	.2	.191	.774	.156	.936	.896	.057	.19	.514	.133
DOG1	.34	.426	.234	.681	.192	.894	.787	.128	.174	.478	.239
DOG3	.347	.5	.092	.56	.2	.83	.798	.162	.273	.364	.273
DYO	.446	.223	.222	.64	.167	.859	.665	.253	.239	.25	.272
EFE2	.382	.382	.182	.527	.218	.927	.655	.255	.164	.364	.291
FAL1	.44	.385	.154	.78	.066	.89	.875	.08	.157	.427	.157
FAL2	.582	.182	.2	.836	.073	.891	.774	.17	.074	.444	.222
FAL3	.329	.414	.228	.729	.043	.843	.843	.1	.186	.329	.2

B-8. Continued.

	LEFT										
	HYPOTHENAR			THENAR		II	III		IV		
TRIBE	O	O/O	Lr	O	O/Q	O	O	L	O	L	D
FOU	.269	.423	.179	.782	.115	.936	.779	.143	.118	.487	.197
FUL	.268	.411	.16	.839	.089	.821	.839	.089	.214	.393	.143
GIN	.404	.319	.224	.596	.181	.926	.872	.106	.149	.468	.17
HEH	.542	.215	.187	.651	.092	.936	.826	.101	.101	.486	.183
KUR	.381	.353	.144	.604	.129	.835	.786	.153	.198	.427	.214
KUS	.478	.217	.217	.75	.125	.917	.833	.104	.083	.438	.271
LES	.541	.162	.216	.838	.108	.946	.73	.27	.081	.405	.243
LUI	.472	.281	.157	.787	.101	.944	.82	.124	.157	.472	.213
MAM	.516	.226	.215	.678	.174	.858	.804	.15	.111	.509	.241
MAN	.414	.448	.103	.655	.103	.862	.828	.103	.138	.345	.241
MER	.657	.143	.115	.771	.057	.943	.943	.057	.229	.486	.114
NDB	.381	.333	.238	.714	.191	.667	.81	.143	.095	.333	.286
PED	.471	.188	.283	.729	.166	.847	.741	.188	.141	.353	.294
SAS	.491	.259	.161	.741	.17	.884	.848	.08	.171	.36	.261
SDN	.412	.294	.205	.765	.146	.941	.794	.147	.147	.441	.265
SHA	.398	.247	.312	.72	.13	.839	.742	.204	.172	.419	.237
SUK	.623	.151	.208	.667	.167	.963	.852	.111	.13	.407	.148
TAN	.543	.174	.195	.729	.084	.958	.833	.146	.146	.479	.146
TSW	.538	.204	.205	.591	.162	.86	.699	.258	.161	.452	.269
VEN	.364	.303	.228	.606	.151	.864	.803	.121	.242	.333	.197
YOR	.412	.275	.285	.742	.105	.895	.78	.138	.154	.431	.268

B-9. Male Palmar Pattern Frequencies of Each Group Used in this Study, Section 2.

	RIGHT										
	HYPOTHENAR			THENAR		II	III		IV		
TRIBE	O	O/O	Lr	O	O/Q	O	O	L	O	L	D
AKA	.229	.381	.238	.743	.126	.81	.505	.371	.248	.438	.267
AOY	.429	.286	.238	.952	.048	.81	.69	.286	.167	.619	.167
ASY	.196	.413	.239	.978	.022	.848	.674	.304	.217	.609	.13
BAG	.307	.535	.12	.891	.04	.762	.594	.347	.168	.515	.248
BAK	.484	.211	.243	.874	.098	.866	.583	.365	.297	.376	.218
BAM	.386	.337	.18	.919	.071	.849	.535	.349	.186	.407	.326
BAO	.414	.366	.172	.885	.062	.784	.586	.344	.291	.383	.216
BAS	.182	.364	.272	.682	.226	.636	.318	.545	.364	.273	.318
BEO	.333	.375	.272	.958	0	.979	.854	.104	.313	.604	.063
BIE	.333	.347	.222	.917	.028	.861	.639	.292	.194	.417	.333
BOZ	.424	.295	.176	.886	.084	.798	.63	.276	.256	.442	.271
BUS	.633	.177	.126	.759	.102	.646	.329	.62	.405	.304	.278
BWA	.504	.298	.134	.885	.06	.83	.522	.441	.244	.439	.256
CHO	.344	.247	.227	.882	.033	.806	.677	.29	.204	.495	.226
CUA	.519	.217	.207	.957	.009	.833	.629	.305	.327	.439	.159
DOG1	.191	.404	.234	.894	.085	.809	.63	.304	.239	.478	.196
DOG3	.25	.53	.16	.851	.099	.703	.53	.4	.354	.293	.232
DYO	.409	.306	.236	.871	.080	.76	.398	.523	.412	.242	.28
EFE2	.341	.378	.183	.793	.049	.854	.39	.512	.354	.293	.268
FAL1	.33	.407	.165	.934	.022	.769	.552	.333	.264	.402	.253
FAL2	.418	.273	.236	.982	0	.852	.585	.302	.173	.462	.25
FAL3	.229	.486	.214	.957	.014	.757	.614	.314	.4	.286	.3

B-9. Continued.

	RIGHT										
	HYPOTHENAR			THENAR		II	III		IV		
TRIBE	O	O/O	Lr	O	O/Q	O	O	L	O	L	D
FOU	.359	.436	.167	.897	0	.846	.587	.333	.276	.421	.25
FUL	.286	.429	.179	.964	.018	.768	.667	.296	.321	.375	.179
GIN	.415	.277	.224	.862	.053	.84	.628	.319	.298	.457	.191
HEH	.468	.229	.193	.873	.064	.891	.545	.327	.264	.455	.182
KUR	.302	.468	.151	.906	.036	.737	.511	.412	.403	.264	.209
KUS	.479	.313	.146	.875	.063	.771	.638	.298	.333	.417	.25
LES	.421	.281	.194	.895	0	.875	.5	.375	.25	.393	.304
LUI	.427	.337	.135	.91	.022	.888	.663	.258	.18	.539	.213
MAM	.453	.244	.244	.885	.062	.764	.574	.366	.17	.44	.32
MAN	.345	.483	.137	.828	.102	.724	.655	.276	.276	.483	.207
MER	.629	.114	.2	.971	0	.886	.743	.229	.371	.429	.086
NDB	.429	.238	.191	.905	.048	.571	.381	.571	.286	.333	.286
PED	.376	.2	.353	.882	.07	.753	.482	.459	.224	.294	.412
SAS	.321	.348	.232	.911	.045	.786	.577	.288	.198	.342	.315
SDN	.206	.353	.324	.882	0	.824	.606	.273	.235	.5	.147
SHA	.441	.247	.259	.914	.054	.828	.495	.43	.28	.301	.28
SUK	.537	.204	.168	.833	.037	.852	.611	.241	.333	.37	.241
TAN	.417	.271	.146	.875	.021	.896	.688	.313	.292	.396	.229
TSW	.398	.28	.248	.849	.076	.796	.516	.409	.269	.419	.269
VEN	.394	.303	.197	.879	.015	.712	.576	.348	.364	.379	.227
YOR	.457	.276	.229	.879	.056	.798	.573	.355	.29	.419	.258

B-10. Female Palmar Pattern Frequencies for Each Group Used in this Study, Section 1.

	LEFT										
	HYPOTHENAR			THENAR		II	III		IV		
TRIBE	O	O/O	Lr	O	O/Q	O	O	L	O	L	D
AKA	.278	.478	.155	.633	.199	.933	.689	.2	.044	.522	.278
BAG	.338	.459	.149	.824	.082	.986	.784	.095	.095	.554	.203
BAK	.59	.238	.143	.59	.334	.952	.875	.104	.143	.459	.214
BAM	.417	.31	.238	.667	.211	.922	.844	.078	.156	.478	.133
BAO	.303	.484	.147	.705	.148	.943	.811	.172	.156	.475	.213
BAS	.214	.583	.126	.689	.165	.971	.738	.155	.107	.553	.184
BIE	.351	.297	.23	.743	.136	.973	.797	.122	.095	.581	.23
BUS	.619	.262	.072	.476	.381	.881	.571	.262	.262	.31	.286
BWA	.517	.268	.155	.699	.161	.968	.753	.214	.103	.494	.288
CHO	.264	.341	.286	.758	.132	.967	.846	.132	.165	.484	.209
CUA	.5	.256	.177	.798	.16	.947	.854	.112	.182	.5	.216
DOG3	.444	.413	.096	.587	.206	.857	.762	.127	.148	.311	.328
DYO	.41	.41	.098	.902	.032	.967	.787	.18	.133	.35	.317
FAL1	.368	.404	.124	.561	.245	.965	.772	.158	.105	.491	.246
FAL2	.214	.429	.178	.857	.143	.893	.714	.179	.214	.321	.286
FOU	.375	.45	.175	.9	.075	.925	.795	.128	.1	.475	.25
GIN	.362	.33	.255	.745	.17	.947	.862	.085	.223	.457	.17
HEH	.47	.205	.253	.633	.223	.967	.833	.111	.156	.5	.144
KUR	.367	.424	.18	.664	.164	.914	.81	.117	.212	.343	.263
LES	.417	.25	.292	.75	.083	1	.667	.292	.25	.417	.208
LUI	.461	.316	.144	.724	.144	.974	.737	.184	.092	.447	.289
MAL	.500	.200	.15	.714	.191	1	.714	.238	.190	.333	.190

B-10. Continued.

	LEFT										
	HYPOTHENAR			THENAR		II	III		IV		
TRIBE	O	O/O	Lr	O	O/Q	O	O	L	O	L	D
MAM	.435	.29	.242	.64	.16	.947	.813	.093	.162	.5	.243
MER	.508	.246	.148	.921	.048	1	.903	.081	.161	.613	.129
NDB	.279	.512	.14	.698	.233	1	.767	.186	.186	.442	.209
PED	.337	.326	.283	.75	.174	.935	.75	.196	.141	.413	.261
SAS	.326	.421	.168	.737	.17	.937	.925	.054	.16	.468	.17
SDN	.238	.476	.191	.762	.096	.952	.905	.095	.19	.524	.19
SHA	.456	.222	.288	.756	.144	.933	.744	.189	.178	.422	.244
TSW	.432	.25	.25	.716	.159	.955	.795	.148	.136	.443	.273
VEN	.364	.318	.242	.727	.136	.97	.727	.212	.212	.424	.242
YOR	.419	.29	.193	.764	.127	.982	.855	.145	.145	.473	.236

B-11. Female Palmar Pattern Frequencies for Each Group Used in this Study, Section 2.

	RIGHT										
	HYPOTHENAR			THENAR		II	II		IV		
TRIBE	O	O/	Lr	O	O/Q	O	O	L	O	L	D
AKA	.278	.433	.21	.767	.144	.856	.567	.3	.144	.578	.256
BAG	.284	.514	.163	.878	.028	.959	.689	.257	.176	.554	.203
BAK	.55	.211	.183	.821	.146	.914	.716	.247	.214	.488	.214
BAM	.375	.318	.227	.867	.022	.865	.625	.261	.159	.5	.284
BAO	.287	.426	.155	.844	.107	.844	.582	.32	.246	.492	.221
BAS	.214	.485	.117	.816	.107	.883	.573	.311	.184	.583	.155
BIE	.288	.356	.233	.89	.014	.945	.795	.137	.205	.575	.178
BUS	.595	.214	.167	.738	.239	.69	.405	.429	.429	.333	.19
BWA	.482	.34	.113	.845	.065	.923	.559	.382	.196	.51	.242
CHO	.253	.385	.22	.912	.066	.967	.681	.253	.209	.495	.264
CUA	.42	.261	.25	.979	0	.908	.628	.326	.273	.432	.239
DOG3	.444	.397	.064	.889	.032	.778	.619	.302	.286	.333	.27
DYO	.344	.426	.18	.967	.016	.836	.525	.39	.305	.322	.288
FAL1	.316	.456	.123	.807	.089	.895	.63	.204	.164	.491	.218
FAL2	.357	.464	.142	.929	.036	.786	.571	.393	.286	.357	.214
FOU	.375	.325	.225	.925	.05	.875	.667	.282	.179	.513	.128
GIN	.298	.362	.245	.83	.086	.947	.713	.234	.223	.489	.234
HEH	.437	.241	.217	.922	.044	.922	.778	.167	.156	.633	.1
KUR	.357	.457	.093	.886	.057	.842	.601	.29	.341	.362	.225
LES	.406	.344	.156	.813	.062	.969	.594	.406	.156	.5	.188
LUI	.421	.276	.223	.882	.079	.947	.645	.342	.092	.513	.303
MAL	.381	.286	.143	.905	.095	.905	.571	.381	.524	.381	.095

B-11. Continued.

	RIGHT										
	HYPOTHENAR			THENAR		II	II		IV		
TRIBE	O	O/	Lr	O	O/Q	O	O	L	O	L	D
MAM	.254	.429	.206	.88	.066	.838	.606	.338	.254	.38	.282
MER	.475	.262	.147	.952	0	.984	.75	.2	.242	.548	.129
NDB	.279	.419	.256	.953	.046	.907	.465	.419	.163	.419	.233
PED	.359	.304	.261	.837	.076	.88	.576	.413	.228	.391	.304
SAS	.284	.505	.137	.884	.085	.905	.713	.191	.277	.457	.191
SDN	.091	.409	.318	.955	0	.864	.727	.273	.045	.591	.318
SHA	.289	.344	.289	.878	.066	.878	.667	.278	.256	.467	.189
TSW	.386	.273	.306	.875	.045	.875	.545	.409	.318	.352	.216
VEN	.424	.333	.197	.848	.06	.909	.606	.258	.182	.515	.212
YOR	.444	.333	.168	.891	.036	.909	.618	.255	.236	.509	.2

APPENDIX C

D-SQUARE DISTANCE MATRICES

C-1. Male 20 Finger Ridge-Count Distance Matrix.

	TRIBE	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1.	AKA	0.0000	1.7116	2.7678	0.8615	1.2652	1.5616	1.2779	1.0899	1.0841	2.6072
2.	ADY	1.7116	0.0000	0.6795	1.4388	1.5724	1.7566	2.0371	1.0945	3.2385	1.4210
3.	ASY	2.7678	0.6795	0.0000	2.0347	2.1644	2.1724	2.6590	1.3391	4.0569	2.0464
4.	BAB	0.8615	1.4388	2.0347	0.0000	0.8118	0.7371	1.3068	0.5692	2.3240	2.2306
5.	BAG	1.2652	1.5724	2.1644	0.8118	0.0000	0.9281	0.7889	0.4566	2.9152	2.4599
6.	BAK	1.5616	1.7566	2.1724	0.7371	0.9281	0.0000	2.1030	0.7306	2.6252	2.8194
7.	BAM	1.2779	2.0371	2.6590	1.3068	0.7889	2.1030	0.0000	0.8798	2.4501	2.4747
8.	BAO	1.0899	1.0945	1.3391	0.5692	0.4566	0.7306	0.8798	0.0000	2.4393	1.9667
9.	BAS	1.0841	3.2385	4.0569	2.3240	2.9152	2.6252	2.4501	2.4393	0.0000	3.4021
10.	BEO	2.6072	1.4210	2.0464	2.2306	2.4599	2.8194	2.4747	1.9667	3.4021	0.0000
11.	BIE	1.0682	1.1676	1.5819	0.6710	1.3937	1.2463	1.9216	0.7263	1.7845	1.7657
12.	BKO	1.4550	1.0385	1.5285	0.5283	0.8227	0.9426	1.1101	0.5940	2.9137	1.7317
13.	BOZ	0.9966	0.8950	1.3497	0.7248	0.6098	1.0992	0.6609	0.2810	2.2448	1.6228
14.	BUS	2.2690	4.3072	4.6104	3.0112	3.5724	2.9107	4.6701	2.8507	4.1956	5.6291
15.	CHO	1.2145	0.7076	1.2905	0.7851	1.0178	1.3452	1.2628	0.5809	2.7001	2.1770
16.	CUA	0.9390	2.0788	2.4377	0.8625	0.8855	1.6090	1.0439	0.6023	2.3189	2.5226
17.	DOG1	1.1449	1.8913	2.0833	0.7900	0.7442	0.9822	1.0814	0.3669	1.9562	2.0454
18.	DOG2	1.7081	1.4188	1.9022	0.9421	0.9087	1.4106	1.3474	0.5309	3.1056	1.8873
19.	DYO	1.0603	1.0647	1.5193	0.6236	0.5931	0.8912	1.2790	0.3061	2.0419	1.8766
20.	EFE	0.4205	2.3999	2.9826	1.0151	1.5852	1.3756	1.8495	1.3024	1.0769	3.0856
21.	EFE2	0.3889	2.6528	3.3463	1.1169	1.5324	1.4404	1.7539	1.2363	1.2187	3.4451
22.	FAL1	1.5552	1.1899	1.7542	0.9809	1.1698	1.1772	1.0871	0.7878	2.8911	1.9017
23.	FAL2	1.4999	1.2207	1.7619	0.5582	0.7389	0.7317	1.3879	0.3424	2.8403	1.4968
24.	FAL3	1.7425	1.4322	2.2846	1.2759	1.3207	0.9807	2.4038	1.0465	2.5784	2.0307
25.	FOU1	1.7987	1.2609	1.7602	1.0067	1.0350	0.9172	1.3246	0.6233	2.8099	2.1025
26.	FUL	1.3993	1.5846	2.0659	0.6582	0.7741	0.5808	1.1782	0.6288	2.8313	2.3884
27.	GIN	0.7314	0.7751	1.3518	0.7152	0.8072	1.1129	1.2084	0.4597	1.8703	1.4370
28.	HEH	0.6968	1.1375	1.5796	0.4118	0.9339	0.6710	1.4213	0.6046	1.7262	2.1127
29.	KIR	0.9290	1.6618	1.8887	1.0035	0.6190	1.2360	0.8234	0.5979	2.1679	2.3818
30.	KUR	1.2024	1.2547	1.5585	0.6692	0.6783	0.7444	0.9853	0.1188	2.5292	1.9397
31.	KUS	1.4126	1.4472	2.3287	1.1589	0.4927	1.4453	0.8122	0.6366	2.6098	2.1827
32.	LES	1.0563	1.6323	2.3461	0.9495	0.5428	1.0950	1.3498	0.7536	2.7224	2.9666
33.	LUI	0.8000	0.8429	1.5659	0.6153	0.8775	1.4267	1.2237	0.6131	1.8499	1.6181
34.	MAM	1.7783	1.1352	1.4902	0.8218	1.0213	1.1798	1.6399	0.5079	3.3626	2.5823
35.	MAN	1.3352	1.8238	2.8702	0.8623	1.4665	1.3383	1.3056	0.9771	2.6806	3.2959
36.	MER	1.7213	1.0505	1.6050	2.1898	2.4098	2.8911	2.5292	1.7470	2.7179	2.1026
37.	NOB	1.3077	2.1091	2.6862	1.3509	2.1726	2.1466	2.5339	1.1189	2.4167	3.0697
38.	PED	0.7585	1.0784	1.9356	0.6408	0.8418	1.1511	1.1735	0.7350	2.0396	2.1367
39.	SAS	0.9348	1.1963	1.9206	0.7204	0.6440	1.0578	0.9471	0.3913	2.1876	2.0041
40.	SON	2.4586	2.2435	1.9539	1.8658	2.7827	2.9583	2.9254	1.8744	3.4339	3.0328
41.	SHA	1.0177	1.5165	2.0697	0.4475	0.4329	0.5199	0.9543	0.3228	1.8473	2.1438
42.	SUK	0.7951	1.4802	2.2422	0.9047	1.5835	1.3070	1.8095	1.1374	1.7607	2.8246
43.	TAN	1.2965	1.2068	1.2502	1.2120	1.7021	1.9629	1.5954	1.0465	2.3790	1.8952
44.	TSW	0.8675	1.0208	1.3013	0.6788	1.0036	1.2877	1.2549	0.5174	2.2502	2.2182
45.	VEN	2.1622	1.8488	1.7105	1.3429	1.4374	1.6186	1.4653	0.7196	3.1958	2.7190
46.	YOR	1.2668	0.8617	1.3816	0.8430	0.7607	0.9011	1.3843	0.3774	2.4567	1.8495

C-1. Continued.

	TRIBE	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
1.	AKA	1.0682	1.4550	0.9966	2.2690	1.2145	0.9390	1.1449	1.7081	1.0603	0.4205
2.	AOY	1.1676	1.0365	0.8950	4.3072	0.7076	2.0788	1.8913	1.4188	1.0647	2.3999
3.	ASY	1.5819	1.5285	1.3497	4.6104	1.2905	2.4377	2.0833	1.9022	1.5193	2.9826
4.	BAB	0.6710	0.5283	0.7248	3.0112	0.7851	0.8625	0.7900	0.9421	0.6236	1.0151
5.	BAG	1.3937	0.8227	0.6098	3.5724	1.0178	0.8855	0.7442	0.9087	0.5931	1.5852
6.	BAK	1.2463	0.9426	1.0992	2.9107	1.3452	1.6090	0.9822	1.4106	0.8912	1.3756
7.	BAM	1.9216	1.1101	0.6609	4.6701	1.2628	1.0439	1.0814	1.3474	1.2790	1.8495
8.	BAO	0.7263	0.5940	0.2810	2.8507	0.5809	0.6023	0.3669	0.5309	0.3061	1.3024
9.	BAS	1.7845	2.9137	2.2448	4.1956	2.7001	2.3189	1.9562	3.1056	2.0419	1.0769
10.	BEO	1.7657	1.7317	1.6228	5.6291	2.1770	2.5226	2.0454	1.8873	1.8766	3.0856
11.	BIE	0.0000	0.9325	0.9406	3.2000	0.7067	1.0004	0.8226	0.9088	0.5040	1.3846
12.	BKO	0.9325	0.0000	0.4624	4.3914	0.3569	1.0904	0.7582	0.8784	0.6249	1.7847
13.	BOZ	0.9406	0.4624	0.0000	3.5428	0.5152	0.8049	0.5422	0.7284	0.3434	1.2249
14.	BUS	3.2000	4.3914	3.5428	0.0000	3.9485	3.1263	3.0529	3.5838	3.3682	1.9978
15.	CHO	0.7067	0.3569	0.5152	3.9485	0.0000	1.1371	0.9864	1.0793	0.5622	1.8066
16.	CUA	1.0004	1.0904	0.8049	3.1263	1.1371	0.0000	0.5528	0.9842	0.8259	1.1658
17.	DOG1	0.8226	0.7582	0.5422	3.0529	0.9864	0.5528	0.0000	0.6533	0.4588	1.0409
18.	DOG2	0.9088	0.8784	0.7284	3.5838	1.0793	0.9842	0.6533	0.0000	0.5136	1.8262
19.	DYO	0.5040	0.6249	0.3434	3.3682	0.5622	0.8259	0.4588	0.5136	0.0000	1.0872
20.	EFE	1.3846	1.7847	1.2249	1.9978	1.8066	1.1658	1.0409	1.8262	1.0872	0.0000
21.	EFE2	1.5604	1.9565	1.2294	1.9174	1.9854	1.1837	1.1739	1.9590	1.2184	0.2219
22.	FAL1	1.4023	0.7187	0.8277	4.2362	0.9715	1.3867	1.3926	1.2883	1.0466	1.8402
23.	FAL2	0.6539	0.4380	0.5330	3.6305	0.7478	0.9639	0.4627	0.3469	0.3225	1.6043
24.	FAL3	1.0202	1.0840	1.0856	3.7407	1.2530	1.5630	1.1312	0.9480	0.5714	1.6002
25.	FOU1	1.2006	0.6486	0.6798	4.0985	0.7483	1.1909	1.0106	1.0767	0.7183	1.8150
26.	FUL	1.4582	0.8106	0.6608	3.3910	1.3576	1.3948	1.1501	1.0873	0.8882	1.3843
27.	GIN	0.4518	0.6206	0.4215	3.0964	0.4999	0.6209	0.6392	0.7604	0.4445	1.1606
28.	HEH	0.5039	0.6235	0.5946	2.7146	0.5755	1.0921	0.8099	1.2658	0.5717	0.8363
29.	KIR	1.1543	0.6826	0.4383	3.6574	0.8466	0.6009	0.5680	1.0749	0.5591	1.0969
30.	KUR	0.7761	0.6219	0.3912	2.9014	0.7131	0.6915	0.5500	0.5501	0.4309	1.4206
31.	KUS	1.3283	0.9068	0.7987	4.4383	1.0061	1.0091	0.7571	0.5430	0.6910	1.8941
32.	LES	1.4151	0.9252	0.6082	3.0631	0.8019	1.3590	1.0642	1.4929	0.6077	1.2098
33.	LUI	0.4039	0.7110	0.4804	3.5970	0.4023	0.9300	0.8933	0.9160	0.2708	1.1780
34.	MAM	0.6999	0.5813	0.8842	3.7907	0.3712	1.1431	0.8008	0.7585	0.6819	2.2014
35.	MAN	1.2638	0.8909	1.1605	4.0046	0.7650	1.4073	1.5125	1.3146	1.2112	1.8583
36.	MER	1.6919	2.1878	1.6054	4.0706	1.4135	2.4377	2.4957	2.5145	1.7691	2.3097
37.	NOB	1.0612	2.0607	1.5021	2.6519	1.5942	1.4344	1.4257	1.2074	1.0651	1.5324
38.	PED	0.6785	0.5650	0.5595	3.1533	0.4314	0.8439	0.9268	1.1047	0.6127	1.1178
39.	SAS	0.8368	0.7308	0.3750	3.0120	0.8535	0.5545	0.5538	0.3693	0.3976	1.1257
40.	SON	1.5418	2.2356	1.7491	3.6999	1.8564	2.3685	1.6830	1.9503	1.6529	2.1373
41.	SHA	0.8837	0.7511	0.5381	3.2917	0.9929	1.0094	0.6194	0.9037	0.4326	1.1531
42.	SUK	0.6083	1.2281	1.2459	2.5819	0.7728	1.3492	1.3596	1.5596	1.1065	1.2629
43.	TAN	0.9080	1.2541	0.8304	3.5717	1.1108	1.0759	1.3719	1.4098	1.1425	1.5581
44.	TSW	0.6101	1.0068	0.7319	2.6153	0.7708	0.7581	0.8602	0.8854	0.8533	1.3373
45.	VEN	1.2525	1.5083	1.0102	3.9831	1.3922	1.3774	1.4158	1.2922	1.1622	2.2511
46.	YOR	0.6206	0.7270	0.6181	3.2947	0.6566	0.7317	0.7936	0.6316	0.4335	1.5250

C-1. Continued.

	TRIBE	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
1.	AKA	0.3889	1.5552	1.4999	1.7425	1.7987	1.3993	0.7314	0.6968	0.9290	1.2024
2.	AOY	2.6528	1.1899	1.2207	1.4322	1.2609	1.5846	0.7751	1.1375	1.6618	1.2547
3.	ASY	3.3463	1.7542	1.7619	2.2846	1.7602	2.0659	1.3518	1.5796	1.8887	1.5585
4.	BAB	1.1169	0.9809	0.5582	1.2759	1.0067	0.6582	0.7152	0.4118	1.0035	0.6692
5.	BAG	1.5324	1.1698	0.7389	1.3207	1.0350	0.7741	0.8072	0.9339	0.6190	0.6783
6.	BAK	1.4404	1.1772	0.7317	0.9807	0.9172	0.5808	1.1129	0.6710	1.2360	0.7444
7.	BAM	1.7539	1.0871	1.3879	2.4038	1.3246	1.1782	1.2084	1.4213	0.8234	0.9853
8.	BAO	1.2363	0.7878	0.3424	1.0465	0.6233	0.6288	0.4597	0.6046	0.5979	0.1188
9.	BAS	1.2187	2.8911	2.8403	2.5784	2.8099	2.8313	1.8703	1.7262	2.1679	2.5292
10.	BEO	3.4451	1.9017	1.4968	2.0307	2.1025	2.3884	1.4370	2.1127	2.3818	1.9397
11.	BIE	1.5604	1.4023	0.6539	1.0202	1.2006	1.4582	0.4518	0.5039	1.1543	0.7761
12.	BKO	1.9565	0.7187	0.4380	1.0840	0.6486	0.8106	0.6206	0.6235	0.6826	0.6219
13.	BOZ	1.2294	0.8277	0.5330	1.0856	0.6798	0.6608	0.4215	0.5946	0.4383	0.3912
14.	BUS	1.9174	4.2362	3.6305	3.7407	4.0985	3.3910	3.0964	2.7146	3.6574	2.9014
15.	CHO	1.9854	0.9715	0.7478	1.2530	0.7483	1.3576	0.4999	0.5755	0.8466	0.7131
16.	CUA	1.1837	1.3867	0.9639	1.5630	1.1909	1.3948	0.6209	1.0921	0.6009	0.6915
17.	DOG1	1.1739	1.3926	0.4627	1.1312	1.0106	1.1501	0.6392	0.8099	0.5680	0.5500
18.	DOG2	1.9590	1.2883	0.3469	0.9480	1.0767	1.0873	0.7604	1.2658	1.0749	0.5501
19.	DYO	1.2184	1.0466	0.3225	0.5714	0.7183	0.8882	0.4445	0.5717	0.5591	0.4309
20.	EFE	0.2219	1.8402	1.6043	1.6002	1.8150	1.3843	1.1606	0.8363	1.0969	1.4206
21.	EFE2	0.0000	1.9951	1.7538	1.9047	2.1627	1.2134	1.2373	0.9355	1.1007	1.3122
22.	FAL1	1.9951	0.0000	0.8099	1.2114	0.4134	0.6267	1.2356	1.1147	1.0894	0.5670
23.	FAL2	1.7538	0.8099	0.0000	0.6285	0.6451	0.7402	0.6529	0.7910	0.8430	0.3281
24.	FAL3	1.9047	1.2114	0.6285	0.0000	0.7692	1.3292	1.0280	1.2405	1.3303	0.8668
25.	FOU1	2.1627	0.4134	0.6451	0.7692	0.0000	0.9192	0.9996	1.0105	1.1246	0.5146
26.	FUL	1.2134	0.6267	0.7402	1.3292	0.9192	0.0000	1.1000	0.7395	0.9488	0.5398
27.	GIN	1.2373	1.2356	0.6529	1.0280	0.9996	1.1000	0.0000	0.4062	0.6348	0.5964
28.	HEH	0.9355	1.1147	0.7910	1.2405	1.0105	0.7395	0.4062	0.0000	0.8113	0.7327
29.	KIR	1.1007	1.0894	0.8430	1.3303	1.1246	0.9488	0.6348	0.8113	0.0000	0.6451
30.	KUR	1.3122	0.5670	0.3281	0.8668	0.5146	0.5398	0.5964	0.7327	0.6451	0.0000
31.	KUS	1.9576	1.2433	0.6967	1.1368	1.1316	1.2989	0.8044	1.3809	0.9185	0.7922
32.	LES	1.1920	1.5803	1.0980	1.5181	1.3062	1.0076	0.8577	0.6222	0.6939	0.9763
33.	LUI	1.3744	1.1263	0.6986	1.0247	0.9271	1.2361	0.3372	0.4443	0.8375	0.7726
34.	MAM	2.3829	1.2356	0.5672	1.4095	0.8946	1.3990	0.7653	0.8401	1.2053	0.7336
35.	MAN	1.8289	0.9425	1.0977	1.7312	0.9439	1.0801	1.1015	0.9094	1.4500	0.8424
36.	MER	2.5195	2.4386	2.4145	2.4281	2.3515	2.7616	1.1057	1.4891	2.4753	1.9894
37.	NOB	1.4204	2.4597	1.3780	1.7340	2.2781	2.2200	1.1569	1.5677	1.8999	1.1394
38.	PED	1.2750	1.0071	0.8886	1.0726	0.7501	0.9929	0.3719	0.3251	0.7833	0.8167
39.	SAS	1.1342	0.9029	0.5139	0.7747	0.7101	0.7173	0.4881	0.8753	0.6075	0.4000
40.	SDN	2.8271	2.8497	1.9383	2.4407	2.4360	3.0252	2.0525	1.8681	2.4572	2.1758
41.	SHA	1.0108	0.9558	0.5638	1.0860	0.8466	0.4541	0.7004	0.5390	0.8528	0.4281
42.	SUK	1.5386	1.4741	1.3088	1.4966	1.2339	1.6635	0.7732	0.5706	1.3535	1.0872
43.	TAN	1.7110	1.4508	1.3819	1.6018	1.4824	1.5231	0.6811	0.9132	1.1708	1.0071
44.	TSW	1.3603	1.4417	0.9771	1.6270	1.3939	1.2170	0.3891	0.5991	1.0512	0.7086
45.	VEN	2.1667	1.2104	1.2060	1.9199	1.1085	1.0513	1.2144	1.1070	1.6084	0.6894
46.	YOR	1.6415	0.7047	0.5288	0.7595	0.4622	0.8410	0.4119	0.7244	0.8537	0.4162

C-1. Continued.

	TRIBE	31.	32.	33.	34.	35.	36.	37.	38.	39.	40.
1.	AKA	1.4126	1.0563	0.8000	1.7783	1.3352	1.7213	1.3077	0.7585	0.9348	2.4586
2.	AOY	1.4472	1.6323	0.8429	1.1352	1.8238	1.0505	2.1091	1.0784	1.1963	2.2435
3.	ASY	2.3287	2.3461	1.5659	1.4902	2.8702	1.6050	2.6862	1.9356	1.9206	1.9539
4.	BAB	1.1589	0.9495	0.6153	0.8218	0.8623	2.1898	1.3509	0.6408	0.7204	1.8658
5.	BAG	0.4927	0.5428	0.8775	1.0213	1.4665	2.4098	2.1726	0.8418	0.6440	2.7827
6.	BAK	1.4453	1.0950	1.4267	1.1798	1.3383	2.8911	2.1466	1.1511	1.0578	2.9583
7.	BAM	0.8122	1.3498	1.2237	1.6399	1.3056	2.5292	2.5339	1.1735	0.9471	2.9254
8.	BAO	0.6366	0.7536	0.6131	0.5079	0.9771	1.7470	1.1189	0.7350	0.3913	1.8744
9.	BAS	2.6098	2.7224	1.8499	3.3626	2.6806	2.7179	2.4167	2.0396	2.1876	3.4339
10.	BEO	2.1827	2.9666	1.6181	2.5823	3.2959	2.1026	3.0697	2.1367	2.0041	3.0328
11.	BIE	1.3283	1.4151	0.4039	0.6999	1.2638	1.6919	1.0612	0.6785	0.8368	1.5418
12.	BKO	0.9068	0.9252	0.7110	0.5813	0.8909	2.1878	2.0607	0.5650	0.7308	2.2356
13.	BOZ	0.7987	0.6082	0.4804	0.8842	1.1605	1.6054	1.5021	0.5595	0.3750	1.7491
14.	BUS	4.4383	3.0631	3.5970	3.7907	4.0046	4.0706	2.6519	3.1533	3.0120	3.6999
15.	CHO	1.0061	0.8019	0.4023	0.3712	0.7650	1.4135	1.5942	0.4314	0.8535	1.8564
16.	CUA	1.0091	1.3590	0.9300	1.1431	1.4073	2.4377	1.4344	0.8439	0.5545	2.3685
17.	DOG1	0.7571	1.0642	0.8933	0.8008	1.5125	2.4957	1.4257	0.9268	0.5538	1.6830
18.	DOG2	0.5430	1.4929	0.9160	0.7585	1.3146	2.5145	1.2074	1.1047	0.3693	1.9503
19.	DYO	0.6910	0.6077	0.2708	0.6819	1.2112	1.7691	1.0651	0.6127	0.3976	1.6529
20.	EFE	1.8941	1.2898	1.1780	2.2014	1.8583	2.3897	1.5324	1.1178	1.1257	2.1373
21.	EFE2	1.9576	1.1920	1.3744	2.3829	1.8289	2.5195	1.4204	1.2750	1.1342	2.8271
22.	FAL1	1.2433	1.5803	1.1263	1.2356	0.9425	2.4386	2.4597	1.0071	0.9029	2.8497
23.	FAL2	0.6967	1.0980	0.6986	0.5672	1.0977	2.4145	1.3780	0.8886	0.5139	1.9383
24.	FAL3	1.1368	1.5181	1.0247	1.4095	1.7312	2.4281	1.7340	1.0726	0.7747	2.4407
25.	FOU1	1.1316	1.3062	0.9271	0.8946	0.9439	2.3515	2.2781	0.7501	0.7101	2.4360
26.	FUL	1.2989	1.0076	1.2361	1.3990	1.0801	2.7616	2.2200	0.9929	0.7173	3.0252
27.	GIN	0.8044	0.8577	0.3372	0.7653	1.1015	1.1057	1.1569	0.3719	0.4881	2.0525
28.	HEH	1.3809	0.6222	0.4443	0.8401	0.9094	1.4891	1.5677	0.3251	0.8753	1.8681
29.	KIR	0.9185	0.6939	0.8375	1.2053	1.4500	2.4753	1.8999	0.7833	0.6075	2.4572
30.	KUR	0.7922	0.9763	0.7726	0.7336	0.8424	1.9894	1.1394	0.8167	0.4000	2.1758
31.	KUS	0.0000	1.3627	0.9857	0.9563	1.2669	2.2209	1.7263	1.1209	0.6155	2.7305
32.	LES	1.3627	0.0000	0.6986	1.2338	1.4196	2.1952	2.0660	0.6184	0.9476	2.7571
33.	LUI	0.9857	0.6986	0.0000	0.8270	1.0817	1.1408	1.2070	0.3648	0.6792	1.6665
34.	MAM	0.9563	1.2338	0.8270	0.0000	0.9477	2.3197	1.7657	0.7694	0.8601	1.9264
35.	MAN	1.2669	1.4196	1.0817	0.9477	0.0000	2.4712	1.7430	0.7912	1.0650	3.3053
36.	MER	2.2209	2.1952	1.1408	2.3197	2.4712	0.0000	1.8142	1.6552	2.2843	2.5555
37.	NOB	1.7263	2.0660	1.2070	1.7657	1.7430	1.8142	0.0000	1.9007	1.3212	2.1303
38.	PED	1.1209	0.6184	0.3648	0.7694	0.7912	1.6552	1.9007	0.0000	0.5494	2.1926
39.	SAS	0.6155	0.9476	0.6792	0.8601	1.0650	2.2843	1.3212	0.5494	0.0000	2.1837
40.	SON	2.7305	2.7571	1.6665	1.9264	3.3053	2.5555	2.1303	2.1926	2.1837	0.0000
41.	SHA	0.7578	0.7244	0.6894	1.0352	1.0162	2.0335	1.4671	0.8136	0.6102	2.5442
42.	SUK	1.6577	1.3513	0.7940	1.1036	0.8667	1.8958	1.5504	0.5988	1.1222	2.0297
43.	TAN	1.6717	1.9407	0.9386	1.6196	1.8192	1.1841	1.5804	1.0298	1.1486	1.4246
44.	TSW	0.9754	1.3946	0.7678	0.7746	1.2140	1.2879	1.0949	0.7712	0.7421	1.5284
45.	VEN	1.6219	1.9167	1.2617	1.3046	1.3558	1.9750	1.9809	1.3598	1.3099	2.2646
46.	YOR	0.8128	1.0698	0.5823	0.5455	0.9764	1.8871	1.6150	0.4833	0.3269	2.4926

C-1. Continued.

	TRIBE	41.	42.	43.	44.	45.	46.
1.	AKA	1.0177	0.7951	1.2965	0.8675	2.1622	1.2668
2.	AOY	1.5165	1.4802	1.2068	1.0208	1.0488	0.8617
3.	ASY	2.0697	2.2422	1.2502	1.3013	1.7105	1.3816
4.	BAB	0.4475	0.9047	1.2120	0.6788	1.3429	0.8430
5.	BAG	0.4329	1.5835	1.7021	1.0036	1.4374	0.7607
6.	BAK	0.5199	1.3070	1.9629	1.2877	1.6186	0.9011
7.	BAM	0.9543	1.8095	1.5954	1.2549	1.4653	1.3843
8.	BAO	0.3228	1.1374	1.0465	0.5174	0.7196	0.3774
9.	BAS	1.8473	1.7607	2.3790	2.2502	3.1958	2.4567
10.	BEO	2.1438	2.8246	1.8952	2.2182	2.7190	1.8495
11.	BIE	0.8837	0.6083	0.9080	0.6101	1.2525	0.6206
12.	BKO	0.7511	1.2281	1.2541	1.0068	1.5083	0.7270
13.	BOZ	0.5381	1.2459	0.8304	0.7319	1.0102	0.6181
14.	BUS	3.2917	2.5819	3.5717	2.6153	3.9831	3.2947
15.	CHO	0.9929	0.7728	1.1108	0.7708	1.3922	0.6566
16.	CUA	1.0094	1.3492	1.0759	0.7581	1.3774	0.7317
17.	DOG1	0.6194	1.3596	1.3719	0.8602	1.4158	0.7936
18.	DOG2	0.9037	1.5596	1.4098	0.8854	1.2922	0.6316
19.	DYO	0.4326	1.1065	1.1425	0.8533	1.1622	0.4335
20.	EFE	1.1531	1.2629	1.5581	1.3373	2.2511	1.5250
21.	EFE2	1.0108	1.5386	1.7110	1.3603	2.1667	1.6415
22.	FAL1	0.9558	1.4741	1.4508	1.4417	1.2104	0.7047
23.	FAL2	0.5638	1.3088	1.3819	0.9771	1.2060	0.5288
24.	FAL3	1.0860	1.4966	1.6018	1.6270	1.9199	0.7595
25.	FOU1	0.8466	1.2339	1.4824	1.3939	1.1085	0.4622
26.	FUL	0.4541	1.6635	1.5231	1.2170	1.0513	0.8410
27.	GIN	0.7004	0.7732	0.6811	0.3891	1.2144	0.4119
28.	HEH	0.5390	0.5706	0.9132	0.5991	1.1070	0.7244
29.	KIR	0.8528	1.3535	1.1708	1.0512	1.6084	0.8537
30.	KUR	0.4281	1.0872	1.0071	0.7086	0.6894	0.4162
31.	KUS	0.7578	1.6577	1.6717	0.9754	1.6219	0.8128
32.	LES	0.7244	1.3513	1.9407	1.3946	1.9167	1.0698
33.	LUI	0.6894	0.7940	0.9386	0.7678	1.2617	0.5823
34.	MAM	1.0352	1.1036	1.6196	0.7746	1.3046	0.5455
35.	MAN	1.0162	0.8667	1.8192	1.2140	1.3558	0.9764
36.	MER	2.0335	1.8958	1.1841	1.2879	1.9750	1.8871
37.	NDB	1.4671	1.5504	1.5804	1.0949	1.9809	1.6150
38.	PEO	0.8136	0.5988	1.0298	0.7712	1.3598	0.4833
39.	SAS	0.6102	1.1222	1.1486	0.7421	1.3099	0.3269
40.	SDN	2.5442	2.0297	1.4246	1.5284	2.2646	2.4926
41.	SHA	0.0000	1.2480	1.4735	0.8790	1.0298	0.6764
42.	SUK	1.2480	0.0000	1.1917	0.7511	1.7210	1.0438
43.	TAN	1.4735	1.1917	0.0000	0.5017	0.8930	1.2118
44.	TSW	0.8790	0.7511	0.5017	0.0000	0.9219	0.7791
45.	VEN	1.0298	1.7210	0.8930	0.9219	0.0000	1.0111
46.	YOR	0.6764	1.0438	1.2118	0.7791	1.0111	0.0000

C-2. Female 20 Finger Ridge-Count Distance Matrix.

	TRIBE	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1.	AKA	0.0000	0.9983	1.1170	1.4677	0.8800	1.0101	0.4960	0.7868	1.3091	2.6400
2.	BAB	0.9983	0.0000	0.9478	0.9543	1.5377	1.1875	1.3244	1.0564	0.5760	3.4780
3.	BAG	1.1170	0.9478	0.0000	1.1341	0.7806	0.5236	0.8426	1.1020	1.2211	3.0163
4.	BAK	1.4677	0.9543	1.1341	0.0000	1.6107	1.1844	1.9049	1.9007	1.0789	3.0039
5.	BAM	0.8800	1.5377	0.7806	1.6107	0.0000	1.1659	0.8030	1.0223	1.9059	2.7427
6.	BAO	1.0101	1.1875	0.5236	1.1844	1.1659	0.0000	1.2055	1.2204	1.4491	3.0129
7.	BAS	0.4960	1.3244	0.8426	1.9049	0.8030	1.2055	0.0000	1.1278	1.8334	3.0495
8.	BIE	0.7868	1.0564	1.1020	1.9007	1.0223	1.2204	1.1278	0.0000	0.8274	3.6196
9.	BKO	1.3091	0.5760	1.2211	1.0789	1.9059	1.4491	1.8334	0.8274	0.0000	4.3358
10.	BUS	2.6400	3.4780	3.0163	3.0039	2.7427	3.0129	3.0495	3.6196	4.3358	0.0000
11.	CHO	1.1688	1.1880	1.2212	1.9371	1.8427	1.1354	1.7293	0.3621	0.9553	3.9517
12.	CUA	0.8096	1.7572	1.1086	1.5027	1.2257	0.7377	1.4476	1.4273	1.8232	2.4153
13.	DOG2	1.0637	0.8527	0.4767	1.0997	1.1586	0.5189	1.3292	1.0877	1.0218	2.8429
14.	DYO	1.2051	1.0739	0.5499	1.1991	0.9623	0.7100	1.0941	1.0456	1.0016	3.5775
15.	EFE	0.3636	1.0325	0.8566	1.4119	0.9936	0.9699	0.2782	0.9084	1.5263	3.1313
16.	EFE2	1.0728	2.4307	1.7477	2.2297	2.0184	1.2969	1.4095	2.5909	3.2246	2.8904
17.	FAL1	1.5286	0.9386	0.8774	1.4836	1.8488	1.1596	1.5396	1.3471	1.0723	3.5729
18.	FAL2	1.8458	1.3469	1.2827	2.2452	1.6975	1.3779	1.7100	1.8628	1.9948	4.2998
19.	FOU	1.2184	1.5500	0.9255	2.3391	1.3105	1.0155	1.2202	0.6942	1.4048	4.0049
20.	GIN	0.8609	0.8917	0.8438	1.2698	1.3486	0.6338	1.2611	0.4164	0.7928	3.1067
21.	HEH	0.4271	1.2345	0.8626	1.4840	1.0387	0.7664	0.7585	0.5674	1.0556	3.1369
22.	KIR	1.5520	1.7454	1.6840	2.1443	1.8208	0.9335	1.8182	2.0197	2.2106	4.6038
23.	KUR	0.8597	0.8003	0.3113	0.9457	0.8521	0.3625	0.9628	0.8943	0.9124	2.6581
24.	LES	0.8745	1.7137	0.9884	1.6084	1.4253	0.7055	1.1941	1.3704	1.4282	3.6126
25.	LUI	1.0029	0.9391	0.9009	1.5224	1.5428	0.8620	1.3041	0.6848	0.6582	3.6687
26.	MAM	1.6101	1.2437	0.5334	1.2367	1.2578	0.5324	1.7119	1.0848	1.2911	3.2281
27.	MER	1.7237	1.8073	1.3334	1.6565	2.3621	1.0254	2.1534	1.6477	1.8780	3.2210
28.	NDB	0.9178	1.2047	0.6550	0.9963	0.9237	0.5969	0.8936	1.1710	1.5631	2.1656
29.	PED	0.5612	0.7790	0.4807	0.7812	0.9099	0.3165	0.8560	0.8103	0.8176	3.1598
30.	SAS	0.6894	1.0251	0.6307	1.9160	1.0389	0.5121	0.7244	0.7583	1.5275	2.6959
31.	SDN	2.2200	1.8442	1.3620	2.5195	2.3732	1.1444	2.2986	1.1867	1.6995	5.4539
32.	SHA	0.6835	1.0442	0.4376	1.2432	0.6246	0.7155	0.6954	0.8365	1.2654	3.0100
33.	TSW	0.6495	1.3206	0.8168	1.7732	1.2729	0.6483	0.6058	1.0183	1.4605	2.8588
34.	VEN	0.7676	1.0367	0.4490	1.2254	0.7187	0.5291	0.8096	0.5331	1.1679	3.1007
35.	YOR	0.9699	1.2148	0.7183	1.4337	0.9370	0.4838	1.1824	0.8830	1.3952	2.4643

C-2. Continued.

	TRIBE	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
1.	AKA	1.1688	0.8096	1.0637	1.2051	0.3636	1.0728	1.5286	1.8458	1.2184	0.8609
2.	BAB	1.1880	1.7572	0.8527	1.0739	1.0325	2.4307	0.9386	1.3469	1.5500	0.8917
3.	BAG	1.2212	1.1086	0.4767	0.5499	0.8566	1.7477	0.8774	1.2827	0.9255	0.8438
4.	BAK	1.9371	1.5027	1.0997	1.1991	1.4119	2.2297	1.4836	2.2452	2.3391	1.2698
5.	BAM	1.8427	1.2257	1.1586	0.9623	0.9936	2.0184	1.8488	1.6975	1.3105	1.3486
6.	BAO	1.1354	0.7377	0.5189	0.7100	0.9699	1.2969	1.1596	1.3779	1.0155	0.6338
7.	BAS	1.7293	1.4476	1.3292	1.0941	0.2782	1.4095	1.5396	1.7100	1.2202	1.2611
8.	BIE	0.3621	1.4273	1.0877	1.0456	0.9084	2.5909	1.3471	1.8628	0.6942	0.4164
9.	BKO	0.9553	1.8232	1.0218	1.0016	1.5263	3.2246	1.0723	1.9948	1.4048	0.7928
10.	BUS	3.9517	2.4153	2.8429	3.5775	3.1313	2.8904	3.5729	4.2998	4.0049	3.1867
11.	CHO	0.0000	1.3960	1.0823	1.2929	1.0742	2.6489	1.3769	2.2057	0.9999	0.3504
12.	CUA	1.3960	0.0000	1.0149	1.6309	1.1649	0.8417	1.7851	2.4142	1.3762	0.8987
13.	DOG2	1.0823	1.0149	0.0000	0.7416	1.1115	2.1324	0.7042	1.3269	1.2848	0.7156
14.	DYO	1.2929	1.6309	0.7416	0.0000	1.0469	2.6206	1.2906	1.9302	1.0492	1.0123
15.	EFE	1.0742	1.1649	1.1115	1.0469	0.0000	1.3688	1.2377	1.6592	1.2266	0.7908
16.	EFE2	2.6489	0.8417	2.1324	2.6206	1.3688	0.0000	3.0941	3.3413	2.4134	1.9711
17.	FAL1	1.3769	1.7851	0.7042	1.2906	1.2377	3.0941	0.0000	0.9379	1.4146	0.7998
18.	FAL2	2.2057	2.4142	1.3269	1.9302	1.6592	3.3413	0.9379	0.0000	1.6488	1.7311
19.	FOU	0.9999	1.3762	1.2848	1.0492	1.2266	2.4134	1.4146	1.6488	0.0000	0.8823
20.	GIN	0.3504	0.8987	0.7156	1.0123	0.7908	1.9711	0.7998	1.7311	0.8823	0.0000
21.	HEH	0.6176	0.7270	0.8410	1.1054	0.4720	1.5670	1.1292	1.5102	0.8823	0.4116
22.	KIR	2.1088	1.2300	1.6695	1.8672	1.5563	1.7504	2.6350	2.0139	1.7021	1.7562
23.	KUR	1.0086	0.7818	0.1510	0.5642	0.8381	1.8322	0.7135	1.1223	0.7736	0.5849
24.	LES	1.4687	0.7291	1.2143	1.1825	1.0353	1.5248	1.4476	1.6793	0.7219	0.9357
25.	LUI	0.7402	1.2369	0.7829	0.9748	1.0555	2.5184	0.7136	1.2160	0.5294	0.4149
26.	MAM	1.0622	1.4724	0.3355	0.8480	1.4990	2.5310	0.9412	1.4235	1.1885	0.7592
27.	MER	1.4346	1.8582	1.5249	1.4295	1.8176	2.1152	2.1052	2.6029	1.9579	1.3038
28.	NOB	1.3486	0.8142	0.9821	0.9104	0.8352	1.1468	1.5066	1.9813	1.2616	0.7295
29.	PED	0.8058	0.6410	0.5144	0.7289	0.5017	1.3743	0.7980	1.2169	0.9346	0.3648
30.	SAS	0.8946	0.9416	0.6348	0.8836	0.6743	1.5379	1.0631	1.3001	0.5963	0.6423
31.	SON	1.0951	2.3449	1.8974	1.4666	1.8465	2.9727	2.0093	2.4919	1.1803	0.9865
32.	SHA	1.1252	0.8810	0.8315	0.8669	0.6109	1.5628	0.9769	1.1639	0.7425	0.6991
33.	TSW	1.0807	0.7265	0.9542	1.2218	0.5550	1.0773	1.3866	1.7488	1.0927	0.6941
34.	VEN	0.7111	1.0354	0.6284	0.8061	0.5871	1.8582	0.6835	1.0701	0.6893	0.3628
35.	YOR	1.0954	0.9430	0.3838	0.9369	1.0410	1.9761	0.9749	1.1785	1.1997	0.7392

C-2. Continued.

	TRIBE	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
1.	AKA	0.4271	1.5520	0.8597	0.8745	1.0029	1.6101	1.7237	0.9178	0.5612	0.6894
2.	BAB	1.2345	1.7454	0.8003	1.7137	0.9391	1.2437	1.8073	1.2047	0.7790	1.0251
3.	BAG	0.8626	1.6840	0.3113	0.9884	0.9009	0.5334	1.3334	0.6550	0.4807	0.6307
4.	BAK	1.4840	2.1443	0.9457	1.6084	1.5224	1.2367	1.6565	0.9963	0.7812	1.9160
5.	BAM	1.0387	1.8208	0.8521	1.4253	1.5428	1.2578	2.3621	0.9237	0.9099	1.0309
6.	BAO	0.7664	0.9335	0.3625	0.7055	0.8620	0.5324	1.0254	0.5969	0.3165	0.5121
7.	BAS	0.7585	1.8182	0.9628	1.1941	1.3041	1.7119	2.1534	0.3936	0.8560	0.7244
8.	BIE	0.5674	2.0197	0.8943	1.3704	0.6848	1.0848	1.6477	1.1710	0.8103	0.7583
9.	BKO	1.0556	2.2106	0.9124	1.4282	0.6582	1.2911	1.8780	1.5631	0.8176	1.5275
10.	BUS	3.1369	4.6038	2.6581	3.6126	3.6687	3.2281	3.2210	2.1656	3.1598	2.6959
11.	CHO	0.6176	2.1088	1.0086	1.4687	0.7402	1.0622	1.4346	1.3486	0.8058	0.8946
12.	CUA	0.7270	1.2300	0.7818	0.7291	1.2369	1.4724	1.8582	0.8142	0.6410	0.9416
13.	DOG2	0.8410	1.6695	0.1510	1.2143	0.7829	0.3355	1.5249	0.9821	0.5144	0.6348
14.	DYO	1.1054	1.8672	0.5642	1.1825	0.9748	0.8480	1.4295	0.9104	0.7289	0.8836
15.	EFE	0.4720	1.5563	0.8381	1.0353	1.0555	1.4990	1.8176	0.8352	0.5017	0.6743
16.	EFE2	1.5670	1.7504	1.8322	1.5248	2.5184	2.5310	2.1152	1.1468	1.3743	1.5379
17.	FAL1	1.1292	2.6350	0.7135	1.4476	0.7136	0.9412	2.1052	1.5066	0.7980	1.0631
18.	FAL2	1.5102	2.0139	1.1223	1.6793	1.2160	1.4235	2.6029	1.9813	1.2169	1.3001
19.	FOU	0.8823	1.7021	0.7736	0.7219	0.5294	1.1885	1.9579	1.2616	0.9346	0.5963
20.	GIN	0.4116	1.7562	0.5849	0.9357	0.4149	0.7592	1.3038	0.7295	0.3648	0.6423
21.	HEH	0.0000	1.6267	0.6195	0.4935	0.4237	1.0822	1.5731	0.7534	0.2797	0.6461
22.	KIR	1.6267	0.0000	1.2235	1.3923	1.9010	2.0793	2.6498	1.7391	1.1037	1.3503
23.	KUR	0.6195	1.2235	0.0000	0.7403	0.5206	0.3912	1.5142	0.7447	0.3135	0.4911
24.	LES	0.4935	1.3923	0.7403	0.0000	0.5218	1.4788	1.7195	0.9347	0.4774	0.8709
25.	LUI	0.4237	1.9010	0.5206	0.5218	0.0000	0.9405	1.6826	1.0091	0.4933	0.6920
26.	MAM	1.0822	2.0793	0.3912	1.4788	0.9405	0.0000	1.3914	0.9768	0.6664	0.8667
27.	MER	1.5731	2.6498	1.5142	1.7195	1.6826	1.3914	0.0000	0.9856	1.4254	1.2393
28.	NDB	0.7534	1.7391	0.7447	0.9347	1.0091	0.9768	0.9856	0.0000	0.6090	0.6411
29.	PED	0.2797	1.1037	0.3135	0.4774	0.4933	0.6664	1.4254	0.6090	0.0000	0.6608
30.	SAS	0.6461	1.3503	0.4911	0.8709	0.6920	0.8667	1.2393	0.6411	0.6608	0.0000
31.	SDN	1.6285	2.0860	1.6407	1.7564	1.3992	1.4322	1.4796	1.6088	1.2616	1.3930
32.	SHA	0.4408	1.6776	0.5853	0.5535	0.6138	0.9080	1.3740	0.4099	0.4025	0.4732
33.	TSW	0.3634	1.2235	0.7241	0.7076	0.8213	1.2835	1.5730	0.5540	0.4744	0.5014
34.	VEN	0.4200	1.7761	0.4349	0.8344	0.5791	0.4520	1.3465	0.6637	0.3069	0.5015
35.	YOR	0.7732	1.4006	0.4211	1.1698	0.9766	0.5401	1.1191	0.7530	0.6419	0.4210

C-2. Continued.

	TRIBE	31.	32.	33.	34.	35.
1.	AKA	2.2200	0.6835	0.6495	0.7676	0.9699
2.	BAB	1.8442	1.0442	1.3206	1.0367	1.2148
3.	BAG	1.3620	0.4376	0.8168	0.4490	0.7183
4.	BAK	2.5195	1.2432	1.7732	1.2254	1.4337
5.	BAM	2.3732	0.6246	1.2729	0.7187	0.9370
6.	BAO	1.1444	0.7155	0.6483	0.5291	0.4838
7.	BAS	2.2986	0.6954	0.6058	0.8096	1.1824
8.	BIE	1.1867	0.8365	1.0183	0.5331	0.8830
9.	BKO	1.6995	1.2654	1.4605	1.1679	1.3952
10.	BUS	5.4539	3.0100	2.8588	3.1007	2.4643
11.	CHO	1.0951	1.1252	1.0807	0.7111	1.0954
12.	CUA	2.3449	0.8810	0.7265	1.0354	0.9430
13.	DOG2	1.8974	0.8315	0.9542	0.6284	0.3838
14.	DYO	1.4666	0.8669	1.2218	0.8061	0.9369
15.	EFE	1.8465	0.6109	0.5550	0.5871	1.0410
16.	EFE2	2.9727	1.5628	1.0773	1.8582	1.9761
17.	FAL1	2.0093	0.9769	1.3866	0.6835	0.9749
18.	FAL2	2.4919	1.1639	1.7488	1.0701	1.1785
19.	FOU	1.1803	0.7425	1.0927	0.6893	1.1997
20.	GIN	0.9865	0.6991	0.6941	0.3628	0.7392
21.	HEH	1.6205	0.4408	0.3634	0.4200	0.7732
22.	KIR	2.0860	1.6776	1.2235	1.7761	1.4006
23.	KUR	1.6407	0.5853	0.7241	0.4349	0.4211
24.	LES	1.7564	0.5535	0.7076	0.8344	1.1698
25.	LUI	1.3992	0.6138	0.8213	0.5791	0.9766
26.	MAM	1.4322	0.9080	1.2835	0.4520	0.5401
27.	MER	1.4796	1.3740	1.5730	1.3465	1.1191
28.	NOB	1.6088	0.4099	0.5540	0.6637	0.7530
29.	PEO	1.2616	0.4025	0.4744	0.3069	0.6419
30.	SAS	1.3930	0.4732	0.5014	0.5015	0.4210
31.	SDN	0.0000	1.4825	1.5108	1.2332	1.6517
32.	SHA	1.4825	0.0000	0.5967	0.3134	0.6552
33.	TSW	1.5108	0.5967	0.0000	0.7901	0.7334
34.	VEN	1.2332	0.3134	0.7901	0.0000	0.5360
35.	YOR	1.6517	0.6552	0.7334	0.5360	0.0000

C-3. Male 10 Finger Ridge-Count Distance Matrix.

	TRIBE	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1.	AKA	0.0000	1.2121	1.3968	0.5675	0.7638	0.9250	1.0776	0.6676	0.4936	1.553
2.	AOY	1.2121	0.0000	0.2653	0.8183	0.7299	1.1317	1.0132	0.5671	2.0051	0.479
3.	ASY	1.3968	0.2653	0.0000	0.6045	0.9677	1.0647	1.2229	0.6179	1.6935	0.473
4.	BAA	0.5675	0.8183	0.6045	0.0000	0.6259	0.5372	0.9061	0.1988	0.7091	0.881
5.	BAG	0.7638	0.7299	0.9677	0.6259	0.0000	0.4899	0.4172	0.2401	1.4698	0.947
6.	BAK	0.9250	1.1317	1.0647	0.5372	0.4899	0.0000	1.1480	0.4666	0.9939	1.189
7.	BAM	1.0776	1.0132	1.2229	0.9061	0.4172	1.1480	0.0000	0.4074	1.8251	0.993
8.	BAO	0.6676	0.5671	0.6179	0.1988	0.2401	0.4666	0.4074	0.0000	1.0718	0.504
9.	BAS	0.4936	2.0051	1.6935	0.7091	1.4698	0.9939	1.8251	1.0718	0.0000	1.862
10.	BEO	1.5539	0.4798	0.4735	0.8815	0.9479	1.1890	0.9933	0.5045	1.8624	0.000
11.	BIE	0.7978	0.8047	0.5295	0.2431	1.0507	0.9299	1.5036	0.4742	0.7572	0.655
12.	BKO	0.9647	0.3663	0.3880	0.4068	0.4213	0.6514	0.5258	0.1585	1.3657	0.334
13.	BOZ	0.6150	0.3667	0.5232	0.3382	0.2584	0.4712	0.4084	0.1296	1.1975	0.581
14.	BUS	1.6174	3.7493	3.9993	2.2232	2.9115	2.1990	3.6956	2.5869	2.3324	4.002
15.	CHO	0.8169	0.1517	0.3445	0.5178	0.6836	0.8530	0.9897	0.3687	1.2860	0.351
16.	CUA	0.5126	1.0712	1.0869	0.4122	0.6367	0.9422	0.5439	0.2559	0.9067	0.664
17.	DOG1	0.5889	1.0929	1.0380	0.4368	0.4802	0.6202	0.5550	0.2052	0.7352	0.652
18.	DOG2	1.0981	0.8748	0.9749	0.6305	0.5623	1.0316	0.8134	0.2880	1.7827	0.494
19.	DYO	0.6018	0.6177	0.7060	0.3192	0.3300	0.6265	0.8686	0.1924	1.0037	0.780
20.	EFE	0.3277	2.0836	1.9667	0.8438	1.2529	0.8964	1.6993	1.0358	0.2796	1.998
21.	EFE2	0.3413	2.1275	1.9915	0.7410	0.9651	0.7458	1.3761	0.8947	0.4588	2.071
22.	FAL1	1.1372	0.5304	0.6630	0.5598	0.5665	0.7849	0.5568	0.1898	1.5193	0.414
23.	FAL2	1.2451	0.7087	0.7240	0.4895	0.4602	0.5538	0.7118	0.1517	1.5912	0.324
24.	FAL3	1.2542	1.0392	1.0626	0.6498	0.8069	0.4954	1.6215	0.4888	1.4065	0.737
25.	FOU	1.2021	0.5574	0.7695	0.6919	0.8270	0.8212	0.9459	0.3548	1.4541	0.383
26.	FUL	0.7823	0.8107	0.7176	0.3198	0.2606	0.2437	0.5068	0.1736	1.1384	0.905
27.	GIN	0.5546	0.4310	0.4433	0.3491	0.5700	0.6996	0.8872	0.2950	0.9796	0.393
28.	HEH	0.4191	0.6006	0.4394	0.2355	0.6438	0.4446	1.1737	0.4112	0.5788	0.860
29.	KIR	0.5754	1.0034	1.0001	0.6712	0.4703	0.7960	0.5577	0.4125	1.0004	0.959
30.	KUR	0.9045	0.7735	0.7491	0.3172	0.4505	0.5878	0.4956	0.0800	1.2887	0.479
31.	KUS	1.0188	0.6636	0.8817	0.7139	0.1705	0.8908	0.4231	0.2381	1.6837	0.543
32.	LES	0.5842	0.9402	1.2083	0.6463	0.2495	0.3854	0.9705	0.4744	1.1876	1.473
33.	LUI	0.5304	0.3624	0.4952	0.3315	0.5947	0.8952	1.0258	0.3242	0.9408	0.668
34.	MAM	0.9405	0.2495	0.4165	0.5145	0.5670	0.9423	0.9221	0.2688	1.4793	0.260
35.	MAN	0.8157	0.5811	0.4414	0.1368	0.5046	0.5512	0.7977	0.0987	0.9904	0.389
36.	MER	1.3257	0.4694	0.2835	0.6047	1.2656	1.0973	1.8792	0.8300	1.5314	0.757
37.	NDB	0.8221	1.4900	1.5164	0.5410	1.1246	1.3283	1.5408	0.6687	1.4280	1.341
38.	PED	0.4797	0.4170	0.5477	0.3971	0.6558	0.6345	1.1390	0.3662	0.8306	0.516
39.	SAS	0.4137	0.8200	1.0772	0.4654	0.3836	0.8472	0.5002	0.1963	1.0898	0.687
40.	SDN	1.1506	1.1615	1.0566	0.8093	1.7918	1.7205	1.7808	1.0614	1.4300	1.474
41.	SHA	0.7327	1.0001	0.8376	0.2177	0.3502	0.3088	0.6673	0.1512	0.7028	0.815
42.	SUK	0.4232	0.8587	0.8194	0.4552	1.2373	1.0540	1.5863	0.6927	0.6823	0.913
43.	TAN	0.9958	0.6512	0.3273	0.4250	1.1963	1.1404	1.1348	0.6137	1.3575	0.729
44.	TSW	0.5892	0.7011	0.5546	0.2635	0.8548	1.0072	0.9741	0.4005	1.0484	0.670
45.	VEN	1.3009	0.5309	0.3221	0.4425	0.7893	0.7504	0.9571	0.3568	1.5263	0.428
46.	YOR	0.7970	0.4409	0.5538	0.4183	0.4922	0.7153	0.8968	0.1875	1.1932	0.272

C-3. Continued.

	TRIBE	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
1.	AKA	0.7978	0.9647	0.6150	1.6174	0.8169	0.5126	0.5889	1.0981	0.6018	0.3277
2.	AOY	0.8047	0.3663	0.3667	3.7493	0.1517	1.0712	1.0929	0.8748	0.6177	2.0836
3.	ASY	0.5295	0.3880	0.5232	3.9993	0.3445	1.0869	1.0380	0.9749	0.7060	1.9667
4.	BAB	0.2431	0.4068	0.3382	2.2232	0.5178	0.4122	0.4368	0.6305	0.3192	0.8438
5.	BAG	1.0507	0.4213	0.2584	2.9115	0.6836	0.6367	0.4802	0.5623	0.3300	1.2529
6.	BAK	0.9299	0.6514	0.4712	2.1990	0.8530	0.9422	0.6202	1.0316	0.6265	0.8964
7.	BAN	1.5036	0.5258	0.4084	3.6956	0.9897	0.5439	0.5550	0.8134	0.8686	1.6993
8.	BAO	0.4742	0.1585	0.1296	2.5869	0.3687	0.2559	0.2052	0.2880	0.1924	1.0358
9.	BAS	0.7572	1.3657	1.1975	2.3324	1.2860	0.9067	0.7352	1.7827	1.0037	0.2796
10.	BEO	0.6550	0.3349	0.5812	4.0023	0.3512	0.6643	0.6529	0.4945	0.7802	1.9982
11.	BIE	0.0000	0.6284	0.7050	2.5922	0.4549	0.5870	0.5906	0.6676	0.4333	0.9965
12.	BKO	0.6284	0.0000	0.0954	3.4061	0.2060	0.4681	0.4270	0.5058	0.3200	1.4658
13.	BOZ	0.7050	0.0954	0.0000	2.7306	0.2402	0.4236	0.4245	0.5652	0.3155	1.1675
14.	BUS	2.5922	3.4061	2.7306	0.0000	3.1768	2.2568	2.4208	2.5391	2.6418	1.3170
15.	CHO	0.4549	0.2060	0.2402	3.1768	0.0000	0.6631	0.6852	0.6980	0.3761	1.4472
16.	CUA	0.5870	0.4681	0.4236	2.2568	0.6631	0.0000	0.1451	0.3263	0.5219	0.7795
17.	DOG1	0.5906	0.4270	0.4245	2.4208	0.6852	0.1451	0.0000	0.3849	0.3677	0.5947
18.	DOG2	0.6676	0.5058	0.5652	2.5391	0.6980	0.3263	0.3849	0.0000	0.4494	1.4279
19.	DYO	0.4333	0.3200	0.3155	2.6418	0.3761	0.5219	0.3677	0.4494	0.0000	0.9382
20.	EFE	0.9965	1.4658	1.1675	1.3170	1.4472	0.7795	0.5947	1.4279	0.9382	0.0000
21.	EFE2	1.1646	1.3189	0.9849	1.3688	1.5370	0.6725	0.5691	1.3054	0.9063	0.1392
22.	FAL1	0.7310	0.2169	0.3078	3.2239	0.3947	0.5515	0.3719	0.4692	0.3761	1.4598
23.	FAL2	0.6549	0.2096	0.3233	2.9509	0.4917	0.4454	0.3490	0.2215	0.4118	1.4959
24.	FAL3	0.6007	0.6110	0.6893	2.2908	0.6458	0.8269	0.6036	0.5029	0.4375	1.2229
25.	FOU	0.7317	0.2498	0.3800	3.2617	0.2668	0.6737	0.5224	0.6706	0.4797	1.5154
26.	FUL	0.7970	0.3450	0.2200	2.4072	0.6972	0.5632	0.3575	0.6135	0.3939	0.9533
27.	GIN	0.3425	0.2351	0.2243	2.5760	0.1707	0.3291	0.4456	0.4709	0.3790	1.0283
28.	HEH	0.2949	0.4515	0.3447	2.2365	0.3479	0.6445	0.5468	0.8763	0.3385	0.6499
29.	KIR	0.9800	0.4046	0.3655	2.7768	0.7141	0.4166	0.2545	0.7008	0.3984	0.7424
30.	KUR	0.6015	0.1970	0.2381	2.5220	0.5226	0.2319	0.1962	0.2200	0.3496	1.1303
31.	KUS	0.8934	0.3610	0.3732	3.5642	0.5867	0.4904	0.4428	0.3329	0.3799	1.6140
32.	LES	1.1225	0.6156	0.3647	2.3155	0.7423	0.9381	0.7101	0.9931	0.3077	0.9318
33.	LUI	0.2786	0.3661	0.3453	2.8776	0.1555	0.5929	0.5929	0.6743	0.1629	1.1050
34.	MAN	0.3566	0.3015	0.3801	3.0811	0.1629	0.5575	0.5311	0.3169	0.2641	1.4741
35.	MAN	0.2184	0.1704	0.2551	2.7575	0.3020	0.3287	0.3036	0.3317	0.2245	1.1213
36.	MER	0.4492	0.5667	0.6703	3.5926	0.3146	1.2481	1.3300	1.2207	0.7580	1.9375
37.	NOB	0.7090	0.9187	0.8494	1.7608	1.0002	0.4703	0.8057	0.5346	0.6710	1.1889
38.	PEO	0.3080	0.3459	0.2955	2.3458	0.1102	0.4926	0.5093	0.6313	0.3200	0.8815
39.	SAS	0.6556	0.4288	0.3119	2.1070	0.5227	0.0950	0.2023	0.2367	0.3357	0.8269
40.	SON	0.7044	1.3937	1.2658	2.4840	1.0774	1.2308	1.2239	1.4020	1.1416	1.4028
41.	SHA	0.5098	0.3791	0.3495	2.7790	0.6586	0.4427	0.2470	0.6477	0.3177	0.8583
42.	SUK	0.2771	0.7923	0.6867	1.7786	0.4541	0.5468	0.6916	0.8800	0.6546	0.6732
43.	TAN	0.4947	0.5726	0.5648	2.7154	0.5805	0.6884	0.8429	0.8689	0.8798	1.3921
44.	TSW	0.2744	0.5854	0.4977	2.1671	0.5202	0.3286	0.5661	0.4936	0.6201	1.0333
45.	VEN	0.4409	0.4908	0.5440	3.0749	0.5484	0.7704	0.6448	0.5780	0.6542	1.5737
46.	YOR	0.3128	0.2396	0.3222	2.7183	0.1969	0.3750	0.3189	0.2233	0.1822	1.1445

C-3. Continued.

	TRIBE	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
1.	AKA	0.3413	1.1372	1.2451	1.2542	1.2021	0.7823	0.5546	0.4191	0.5754	0.9045
2.	AOY	2.1275	0.5304	0.7087	1.0392	0.5574	0.8107	0.4310	0.6006	1.0034	0.7735
3.	ASY	1.9915	0.6630	0.7240	1.0626	0.7695	0.7176	0.4433	0.4394	1.0001	0.7491
4.	BAB	0.7410	0.5598	0.4835	0.6498	0.6919	0.3198	0.3491	0.2355	0.6712	0.3172
5.	BAG	0.9651	0.5665	0.4602	0.8069	0.8270	0.2606	0.5700	0.6438	0.4703	0.4505
6.	BAK	0.7458	0.7849	0.5538	0.4954	0.8212	0.2437	0.6996	0.4446	0.7960	0.5878
7.	BAM	1.3761	0.5568	0.7118	1.6215	0.9459	0.5068	0.8072	1.1737	0.5577	0.4956
8.	BAO	0.8947	0.1898	0.1517	0.4888	0.3548	0.1736	0.2950	0.4112	0.4125	0.0800
9.	BAS	0.4588	1.5133	1.5912	1.4065	1.4541	1.1384	0.9796	0.5788	1.0004	1.2087
10.	BEO	2.0710	0.4145	0.3247	0.7372	0.3836	0.9054	0.3936	0.8609	0.9594	0.4797
11.	BIE	1.1646	0.7310	0.6549	0.6007	0.7317	0.7970	0.3425	0.2949	0.9800	0.6015
12.	BKO	1.3189	0.2169	0.2096	0.6110	0.2498	0.3450	0.2351	0.4515	0.4046	0.1970
13.	BOZ	0.9849	0.3078	0.3233	0.6893	0.3800	0.2200	0.2243	0.3447	0.3655	0.2381
14.	BUS	1.3688	3.2239	2.9509	2.2908	3.2617	2.4072	2.5760	2.2365	2.7768	2.5220
15.	CHO	1.5370	0.3947	0.4917	0.6458	0.2668	0.6972	0.1707	0.3479	0.7141	0.5226
16.	CUA	0.6725	0.5515	0.4454	0.8269	0.6737	0.5632	0.3291	0.6445	0.4166	0.2319
17.	DOG1	0.5691	0.3719	0.3490	0.6036	0.5224	0.3575	0.4456	0.5468	0.2545	0.1962
18.	DOG2	1.3054	0.4692	0.2215	0.5029	0.6706	0.6135	0.4709	0.8763	0.7008	0.2200
19.	DYO	0.9063	0.3761	0.4118	0.4375	0.4797	0.3939	0.3790	0.3385	0.3984	0.3496
20.	EFE	0.1392	1.4598	1.4959	1.2229	1.5154	0.9533	1.0283	0.6499	0.7424	1.1303
21.	EFE2	0.0000	1.4997	1.3439	1.2512	1.6411	0.7409	0.9760	0.6960	0.6286	0.9767
22.	FAL1	1.4997	0.0000	0.2350	0.6129	0.1323	0.3894	0.5845	0.7089	0.5400	0.1828
23.	FAL2	1.3439	0.2350	0.0000	0.2872	0.3065	0.3576	0.4101	0.7045	0.6580	0.0952
24.	FAL3	1.2512	0.6129	0.2872	0.0000	0.4837	0.6637	0.5712	0.6441	0.9513	0.4556
25.	FOU	1.6411	0.1323	0.3065	0.4837	0.0000	0.6662	0.5170	0.7171	0.7125	0.3402
26.	FUL	0.7409	0.3894	0.3576	0.6637	0.6662	0.0000	0.5566	0.4080	0.3956	0.2302
27.	GIN	0.9760	0.5845	0.4101	0.5712	0.5170	0.5566	0.0000	0.2343	0.5183	0.3838
28.	HEH	0.6960	0.7089	0.7045	0.6441	0.7171	0.4080	0.2343	0.0000	0.5356	0.5865
29.	KIR	0.6286	0.5400	0.6580	0.9513	0.7125	0.3956	0.5183	0.5356	0.0000	0.4085
30.	KUR	0.9767	0.1828	0.0952	0.4556	0.3402	0.2302	0.3838	0.5865	0.4085	0.0000
31.	KUS	1.3833	0.4965	0.3378	0.8203	0.7168	0.5413	0.4825	0.8455	0.6136	0.4081
32.	LES	0.7238	0.8111	0.7861	0.7413	0.9004	0.3767	0.6910	0.4876	0.5017	0.7035
33.	LUI	1.1993	0.5003	0.6414	0.7048	0.4964	0.6729	0.2576	0.2658	0.6610	0.5742
34.	MAM	1.5791	0.2872	0.3316	0.5083	0.3375	0.6484	0.2767	0.4951	0.7453	0.3927
35.	MAN	1.0390	0.3171	0.1648	0.3678	0.3725	0.3449	0.1965	0.3200	0.5800	0.1545
36.	MER	1.9645	1.0642	0.9130	0.8894	0.8715	1.0822	0.3759	0.4063	1.3444	1.0098
37.	NOB	0.9712	1.2029	0.8108	0.8001	1.2042	1.0602	0.5715	0.8795	1.0242	0.6256
38.	PED	0.9856	0.5616	0.5185	0.4598	0.4022	0.6387	0.0882	0.1811	0.6145	0.5107
39.	SAS	0.7239	0.4685	0.4057	0.6945	0.5911	0.5056	0.3047	0.6052	0.3838	0.2502
40.	SON	1.8137	0.9835	1.5341	1.6599	1.2450	1.2122	1.2354	0.8878	1.5418	1.1790
41.	SHA	0.7039	0.4831	0.3491	0.5754	0.6297	0.2282	0.4888	0.4151	0.5553	0.3021
42.	SUK	0.9001	0.9414	0.9697	0.8283	0.8179	0.9586	0.2956	0.2785	0.8631	0.7711
43.	TAN	1.4094	0.7547	0.8291	1.1996	0.9234	0.6610	0.4382	0.4309	0.8787	0.5923
44.	TSW	1.0077	0.7722	0.6586	0.9394	0.9295	0.6378	0.2420	0.3762	0.8258	0.4763
45.	VEN	1.6376	0.3794	0.4062	0.7422	0.6218	0.4339	0.5757	0.5505	1.0163	0.4152
46.	YOR	1.2027	0.2706	0.1960	0.2805	0.2602	0.5317	0.1909	0.4150	0.5530	0.2490

C-3. Continued.

	TRIBE	31.	32.	33.	34.	35.	36.	37.	38.	39.	40.
1.	AKA	1.0188	0.5842	0.5304	0.9405	0.8157	1.3257	0.8221	0.4797	0.4137	1.1506
2.	ADY	0.6636	0.9402	0.3624	0.2495	0.5811	0.4694	1.4900	0.4170	0.8200	1.1615
3.	ASY	0.8817	1.2083	0.4952	0.4165	0.4414	0.2835	1.5164	0.5477	1.0772	1.0566
4.	BAB	0.7139	0.6463	0.3315	0.5145	0.1368	0.6047	0.5410	0.3971	0.4654	0.8093
5.	BAG	0.1705	0.2495	0.5947	0.5670	0.5046	1.2656	1.1246	0.6558	0.3836	1.7918
6.	BAK	0.8908	0.3854	0.8952	0.9423	0.5512	1.0973	1.3283	0.6345	0.8472	1.7205
7.	BAM	0.4231	0.9705	1.0258	0.9221	0.7977	1.8792	1.5408	1.1390	0.5002	1.7808
8.	BAO	0.2381	0.4744	0.3242	0.2688	0.0987	0.8300	0.6687	0.3662	0.1963	1.0614
9.	BAS	1.6837	1.1876	0.9408	1.4793	0.9904	1.5314	1.4280	0.8306	1.0898	1.4300
10.	BEO	0.5430	1.4739	0.6681	0.2606	0.3891	0.7573	1.3412	0.5163	0.6879	1.4741
11.	BIE	0.8934	1.1225	0.2786	0.3566	0.2184	0.4492	0.7090	0.3080	0.6556	0.7044
12.	BKO	0.3610	0.6156	0.3661	0.3015	0.1704	0.5667	0.9187	0.3459	0.4288	1.3937
13.	BOZ	0.3732	0.3647	0.3453	0.3801	0.2551	0.6703	0.8494	0.2955	0.3119	1.2658
14.	BUS	3.5642	2.3155	2.8776	3.0811	2.7575	3.5926	1.7608	2.3458	2.1070	2.4840
15.	CHO	0.5867	0.7423	0.1555	0.1629	0.3020	0.3146	1.0002	0.1102	0.5227	1.0774
16.	CUA	0.4904	0.9381	0.5929	0.5575	0.3287	1.2481	0.4703	0.4926	0.0950	1.2308
17.	DOG1	0.4428	0.7101	0.5929	0.5311	0.3096	1.3300	0.8057	0.5093	0.2023	1.2239
18.	DOG2	0.3329	0.9931	0.6743	0.3169	0.3317	1.2207	0.5346	0.6313	0.2367	1.4020
19.	DYO	0.3799	0.3077	0.1629	0.2641	0.2245	0.7580	0.6710	0.3200	0.3357	1.1416
20.	EFE	1.6140	0.9318	1.1050	1.4741	1.1213	1.9375	1.1889	0.8815	0.8269	1.4028
21.	EFE2	1.3833	0.7238	1.1993	1.5791	1.0390	1.9645	0.9712	0.9856	0.7239	1.8137
22.	FAL1	0.4965	0.8111	0.5003	0.2872	0.3171	1.0642	1.2029	0.5616	0.4685	0.9835
23.	FAL2	0.3378	0.7861	0.6414	0.3316	0.1648	0.9130	0.8108	0.5185	0.4057	1.5341
24.	FAL3	0.8203	0.7413	0.7048	0.5083	0.3678	0.8894	0.8001	0.4598	0.6945	1.6599
25.	FOU	0.7168	0.9004	0.4964	0.3375	0.3725	0.8715	1.2042	0.4022	0.5911	1.2450
26.	FUL	0.5413	0.3767	0.6729	0.6484	0.3449	1.0822	1.0602	0.6387	0.5056	1.2122
27.	GIN	0.4825	0.6910	0.2576	0.2767	0.1965	0.3759	0.5715	0.0882	0.3047	1.2354
28.	HEH	0.8455	0.4876	0.2658	0.4951	0.3200	0.4063	0.8795	0.1811	0.6052	0.8878
29.	KIR	0.6136	0.5017	0.6610	0.7453	0.5800	1.3444	1.0242	0.6145	0.3838	1.5418
30.	KUR	0.4081	0.7035	0.5742	0.3927	0.1545	1.0098	0.6256	0.5107	0.2502	1.1790
31.	KUS	0.0000	0.6839	0.5401	0.3551	0.3985	1.1988	1.0439	0.6440	0.3117	1.8378
32.	LES	0.6839	0.0000	0.5900	0.8378	0.6905	1.1886	1.0883	0.5939	0.6197	1.8274
33.	LUI	0.5401	0.5900	0.0000	0.1831	0.2731	0.4430	0.7869	0.1631	0.4323	0.8588
34.	MAM	0.3551	0.8378	0.1831	0.0000	0.2339	0.5739	0.8909	0.2494	0.3876	0.9195
35.	MAN	0.3985	0.6905	0.2731	0.2339	0.0000	0.4867	0.5589	0.2746	0.3531	1.0614
36.	MER	1.1988	1.1886	0.4430	0.5739	0.4867	0.0000	1.1622	0.3775	1.2070	1.4313
37.	NDB	1.0439	1.0883	0.7869	0.8909	0.5589	1.1622	0.0000	0.7063	0.4615	1.6916
38.	PED	0.6440	0.5939	0.1631	0.2494	0.2746	0.3775	0.7063	0.0000	0.3843	1.0562
39.	SAS	0.3117	0.6197	0.4323	0.3876	0.3531	1.2070	0.4615	0.3843	0.0000	1.2390
40.	SDN	1.8378	1.8274	0.8588	0.9195	1.0614	1.4313	1.6916	1.0562	1.2390	0.0000
41.	SHA	0.4302	0.5170	0.5077	0.5956	0.1951	0.9795	0.9395	0.5358	0.4701	1.3705
42.	SUK	1.2334	1.0840	0.3945	0.5716	0.5279	0.6224	0.6521	0.2049	0.5725	0.6918
43.	TAN	1.1879	1.3669	0.6754	0.6495	0.4904	0.6052	1.0379	0.5992	0.8314	0.6225
44.	TSW	0.7526	1.1158	0.4408	0.4388	0.3152	0.6617	0.5488	0.3903	0.3983	0.6984
45.	VEN	0.7160	1.1863	0.6210	0.3438	0.3189	0.7666	1.3499	0.6324	0.7823	0.6736
46.	YOR	0.3211	0.6780	0.2142	0.0634	0.1372	0.6097	0.6543	0.1731	0.2590	1.0939

C-3. Continued.

	TRIBE	41.	42.	43.	44.	45.	46.
1.	AKA	0.7327	0.4232	0.9958	0.5892	1.3009	0.7970
2.	ADY	1.0001	0.8587	0.6512	0.7011	0.5309	0.4409
3.	ASY	0.8376	0.8194	0.3273	0.5546	0.3221	0.5538
4.	BAB	0.2177	0.4552	0.4250	0.2635	0.4425	0.4183
5.	BAG	0.3502	1.2373	1.1963	0.8548	0.7893	0.4922
6.	BAK	0.3088	1.0540	1.1404	1.0072	0.7504	0.7153
7.	BAM	0.6673	1.5863	1.1348	0.9741	0.9571	0.8968
8.	BAO	0.1512	0.6927	0.6137	0.4005	0.3568	0.1875
9.	BAS	0.7028	0.6823	1.3575	1.0484	1.5263	1.1932
10.	BEO	0.8155	0.9135	0.7297	0.6704	0.4281	0.2720
11.	BIE	0.5098	0.2771	0.4947	0.2744	0.4409	0.3128
12.	BKO	0.3791	0.7923	0.5726	0.5854	0.4908	0.2396
13.	BOZ	0.3495	0.6867	0.5648	0.4977	0.5440	0.3222
14.	BUS	2.7790	1.7786	2.7154	2.1671	3.0749	2.7183
15.	CHO	0.6586	0.4541	0.5805	0.5202	0.5484	0.1969
16.	CUA	0.4427	0.5468	0.6884	0.3286	0.7704	0.3750
17.	DOG1	0.2470	0.6916	0.8429	0.5661	0.6448	0.3109
18.	DOG2	0.6477	0.8800	0.8689	0.4936	0.5780	0.2233
19.	DYO	0.3177	0.6546	0.8798	0.6201	0.6542	0.1822
20.	EFE	0.8583	0.6732	1.3921	1.0333	1.5737	1.1445
21.	EFE2	0.7039	0.9001	1.4094	1.0077	1.6376	1.2027
22.	FAL1	0.4831	0.9414	0.7547	0.7722	0.3794	0.2706
23.	FAL2	0.3491	0.9697	0.8291	0.6586	0.4062	0.1960
24.	FAL3	0.5754	0.8283	1.1996	0.9394	0.7422	0.2805
25.	FOU	0.6297	0.8179	0.9234	0.9295	0.6218	0.2602
26.	FUL	0.2282	0.9586	0.6610	0.6378	0.4339	0.5317
27.	GIN	0.4888	0.2956	0.4382	0.2420	0.5757	0.1909
28.	HEH	0.4151	0.2785	0.4309	0.3762	0.5505	0.4150
29.	KIR	0.5553	0.8631	0.8787	0.8258	1.0163	0.5530
30.	KUR	0.3021	0.7711	0.5923	0.4763	0.4152	0.2490
31.	KUS	0.4302	1.2334	1.1879	0.7526	0.7160	0.3211
32.	LES	0.5170	1.0840	1.3669	1.1158	1.1863	0.6780
33.	LUI	0.5077	0.3945	0.6754	0.4408	0.6210	0.2142
34.	MAM	0.5956	0.5716	0.6495	0.4388	0.3438	0.0634
35.	MAN	0.1951	0.5279	0.4904	0.3152	0.3189	0.1372
36.	MER	0.9795	0.6224	0.6052	0.6617	0.7666	0.6097
37.	NOB	0.9395	0.6521	1.0379	0.5488	1.3499	0.6543
38.	PEO	0.5358	0.2049	0.5992	0.3903	0.6324	0.1731
39.	SAS	0.4701	0.5725	0.8314	0.3983	0.7823	0.2590
40.	SDN	1.3705	0.6918	0.6225	0.6984	0.6736	1.0939
41.	SHA	0.0000	0.8867	0.9110	0.6368	0.5388	0.4219
42.	SUK	0.8867	0.0000	0.4546	0.2792	0.8183	0.4873
43.	TAN	0.9110	0.4546	0.0000	0.2148	0.3882	0.6963
44.	TSW	0.6368	0.2792	0.2148	0.0000	0.4259	0.4359
45.	VEN	0.5388	0.8183	0.3882	0.4259	0.0000	0.4257
46.	YOR	0.4219	0.4873	0.6963	0.4359	0.4257	0.0000

C-4. Female 10 Finger Ridge-Count Distance Matrix.

	TRIBE	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1.	AKA	0.0000	0.6190	0.6203	0.7282	0.5005	0.5346	0.2633	0.5708	0.7921	1.3382
2.	BAB	0.6190	0.0000	0.4474	0.4298	0.6961	0.3614	0.6061	0.5440	0.3413	2.1848
3.	BAG	0.6203	0.4474	0.0000	0.3702	0.3479	0.2346	0.5232	0.4477	0.5282	1.9243
4.	BAK	0.7282	0.4298	0.3702	0.0000	0.8166	0.3887	0.9087	0.7579	0.3273	2.4755
5.	BAM	0.5005	0.6961	0.3479	0.8166	0.0000	0.6895	0.2939	0.5172	1.0246	1.8628
6.	BAO	0.5346	0.3614	0.2346	0.3887	0.6895	0.0000	0.7426	0.5083	0.3193	2.0302
7.	BAS	0.2633	0.6061	0.5232	0.9087	0.2939	0.7426	0.0000	0.6276	1.0822	1.2749
8.	BIE	0.5708	0.5440	0.4477	0.7579	0.5172	0.5083	0.6276	0.0000	0.3811	2.2632
9.	BKO	0.7921	0.3413	0.5282	0.3273	1.0246	0.3193	1.0822	0.3811	0.0000	3.0938
10.	BUS	1.3382	2.1848	1.9243	2.4755	1.8628	2.0302	1.2749	2.2632	3.0938	0.0000
11.	CHO	0.6984	0.7201	0.5668	0.7809	0.9599	0.4393	1.0402	0.1576	0.3530	2.3400
12.	CUA	0.3539	1.1734	0.6891	0.7357	1.0099	0.5805	0.8269	1.0735	1.0627	1.5139
13.	DOG2	0.6379	0.5554	0.2291	0.6855	0.7056	0.1477	0.8474	0.6259	0.5605	2.1308
14.	DYO	0.7259	0.3152	0.1361	0.3914	0.4987	0.1797	0.7471	0.3145	0.2277	2.6687
15.	EFE	0.2153	0.4061	0.4375	0.6119	0.3700	0.5255	0.1464	0.5677	0.7493	1.6492
16.	EFE2	0.6819	1.3452	1.2983	1.1119	1.3259	1.3067	0.8552	1.8472	1.8978	1.0715
17.	FAL1	1.3496	0.7893	0.5217	1.0994	1.3625	0.5984	1.0447	1.1042	0.9747	2.2820
18.	FAL2	1.7766	0.8125	1.3511	1.7892	1.8319	0.9009	1.5074	1.7505	1.4038	3.2188
19.	FOU	0.4811	0.2721	0.3250	0.4755	0.6873	0.0868	0.7544	0.3160	0.2122	2.0664
20.	GIN	0.5774	0.4986	0.3478	0.5693	0.8535	0.3224	0.6951	0.2102	0.3269	1.9008
21.	HEH	0.2412	0.6497	0.4853	0.5699	0.7376	0.3579	0.5342	0.3511	0.4872	1.7516
22.	KIR	0.8832	0.7729	1.0934	1.0036	1.0955	0.7429	0.9901	1.3548	0.9768	3.2326
23.	KUR	0.4492	0.4333	0.1765	0.5138	0.4998	0.0627	0.5686	0.5278	0.4858	1.9314
24.	LES	0.5090	0.7468	0.7296	0.5030	1.2349	0.3047	0.9882	0.9449	0.5317	2.3010
25.	LUI	0.6650	0.4933	0.4871	0.6404	1.1458	0.2171	0.9457	0.4695	0.2847	2.3621
26.	MAM	1.0911	0.6025	0.2158	0.6739	0.7670	0.2599	1.1679	0.5403	0.5285	2.4986
27.	MER	1.1256	0.7805	0.8452	0.7004	1.5985	0.3751	1.5088	0.7713	0.5061	2.3416
28.	NOB	0.4700	0.5352	0.3319	0.5144	0.5743	0.4265	0.5321	0.4270	0.7154	1.2245
29.	PED	0.3915	0.2473	0.2010	0.1902	0.5874	0.1087	0.5473	0.4455	0.2193	2.1246
30.	SAS	0.4134	0.4324	0.4410	0.9356	0.6868	0.2596	0.5462	0.4747	0.7151	1.3296
31.	SON	1.5338	0.5977	0.8265	0.7724	1.5124	0.7116	1.6622	0.5081	0.2657	3.5296
32.	SHA	0.4040	0.3479	0.1773	0.3459	0.5490	0.2367	0.4792	0.3919	0.4414	1.6909
33.	TSW	0.1603	0.6071	0.4284	0.6110	0.5708	0.3650	0.3823	0.4268	0.6856	1.2384
34.	VEN	0.5757	0.2568	0.1840	0.4490	0.5827	0.2095	0.5604	0.3149	0.3375	1.8887
35.	YOR	0.6088	0.5048	0.2041	0.7257	0.5191	0.1874	0.5279	0.4052	0.6355	1.6685

C-4. Continued.

	TRIBE	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
1.	AKA	0.6984	0.3539	0.6379	0.7259	0.2153	0.6819	1.3496	1.7766	0.4811	0.5774
2.	BAB	0.7201	1.1734	0.5554	0.3152	0.4061	1.3452	0.7893	0.8125	0.2721	0.4986
3.	BAG	0.5668	0.6891	0.2291	0.1361	0.4375	1.2983	0.5217	1.3511	0.3250	0.3478
4.	BAK	0.7809	0.7357	0.6055	0.3914	0.6119	1.1119	1.0994	1.7892	0.4755	0.5693
5.	BAM	0.9599	1.0099	0.7056	0.4987	0.3700	1.3259	1.3625	1.8319	0.6873	0.8535
6.	BAO	0.4393	0.5805	0.1477	0.1797	0.5255	1.3067	0.5984	0.9009	0.0868	0.3224
7.	BAS	1.0402	0.8269	0.8474	0.7471	0.1464	0.8552	1.0447	1.5074	0.7544	0.6951
8.	BIE	0.1576	1.0735	0.6259	0.3145	0.5677	1.8472	1.1042	1.7505	0.3160	0.2102
9.	BKO	0.3530	1.0627	0.5605	0.2277	0.7493	1.8978	0.9747	1.4038	0.2122	0.3269
10.	BUS	2.3400	1.5139	2.1308	2.6687	1.6492	1.0715	2.2820	3.2188	2.0664	1.9008
11.	CHO	0.0000	0.9166	0.5199	0.4032	0.7921	1.9693	1.1210	1.9194	0.2856	0.1262
12.	CUA	0.9166	0.0000	0.6690	0.9743	0.7178	0.5553	1.4411	2.3014	0.7290	0.7549
13.	DOG2	0.5199	0.6690	0.0000	0.2150	0.6109	1.6445	0.5466	1.1048	0.2044	0.4300
14.	DYO	0.4032	0.9743	0.2150	0.0000	0.5175	1.8117	0.6263	1.1148	0.1831	0.3229
15.	EFE	0.7921	0.7178	0.6109	0.5175	0.0000	0.9353	1.0063	1.3667	0.5749	0.5325
16.	EFE2	1.9693	0.5553	1.6445	1.8117	0.9353	0.0000	2.1520	2.5630	1.4830	1.5337
17.	FAL1	1.1210	1.4411	0.5466	0.6263	1.0063	2.1520	0.0000	0.8748	0.7259	0.6055
18.	FAL2	1.9194	2.3014	1.1048	1.1148	1.3667	2.5630	0.8748	0.0000	1.0353	1.5068
19.	FOU	0.2856	0.7290	0.2044	0.1831	0.5749	1.4830	0.7259	1.0353	0.0000	0.2625
20.	GIN	0.1262	0.7549	0.4300	0.3229	0.5325	1.5337	0.6055	1.5068	0.2625	0.0000
21.	HEH	0.2660	0.3493	0.5167	0.5039	0.3297	1.0076	1.0833	1.7343	0.3761	0.1937
22.	KIR	1.6604	1.1673	1.1139	0.9257	0.8758	1.3117	1.7052	0.9602	0.8726	1.4446
23.	KUR	0.5235	0.5675	0.0760	0.1767	0.3738	1.3394	0.5624	0.9475	0.1736	0.3845
24.	LES	0.6924	0.4273	0.5454	0.6600	0.5631	1.1583	1.1367	1.4827	0.4760	0.5527
25.	LUI	0.2496	0.7631	0.2956	0.3272	0.6081	1.7033	0.5789	1.1074	0.2233	0.1401
26.	MAM	0.4765	1.1554	0.1844	0.1622	0.9520	2.1640	0.6235	1.3315	0.2679	0.4481
27.	MER	0.4472	1.0352	0.7913	0.7128	1.1789	1.7355	1.1257	1.4701	0.4289	0.4075
28.	NOB	0.4326	0.5647	0.6059	0.5317	0.4402	0.7968	1.0432	1.7344	0.4547	0.2842
29.	PED	0.4412	0.5404	0.2549	0.1549	0.2686	1.1330	0.6571	1.1223	0.1809	0.2617
30.	SAS	0.4663	0.7057	0.2707	0.4686	0.4925	1.2194	0.7021	0.9130	0.2085	0.3538
31.	SON	0.4762	1.8356	0.9909	0.4886	1.3996	2.6359	1.1409	1.6421	0.5082	0.4773
32.	SHA	0.3799	0.4774	0.3347	0.2689	0.2846	0.9064	0.7167	1.3302	0.3015	0.1899
33.	TSW	0.4124	0.2650	0.5097	0.5756	0.2924	0.6586	1.1001	1.6618	0.3917	0.2950
34.	VEN	0.3403	0.9195	0.2462	0.1534	0.3620	1.5906	0.4237	1.1088	0.1898	0.1579
35.	YOR	0.5033	0.7223	0.2960	0.2863	0.5547	1.2780	0.5332	0.9159	0.2604	0.3207

C-4. Continued.

	TRIBE	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
1.	AKA	0.2412	0.8832	0.4492	0.5090	0.6650	1.0911	1.1256	0.4700	0.3915	0.4134
2.	BAB	0.6497	0.7729	0.4333	0.7468	0.4933	0.6025	0.7805	0.5352	0.2473	0.4324
3.	BAG	0.4853	1.0934	0.1765	0.7296	0.4871	0.2158	0.8452	0.3319	0.2010	0.4410
4.	BAK	0.5699	1.0036	0.5138	0.5030	0.6404	0.6739	0.7004	0.5144	0.1902	0.9356
5.	BAN	0.7376	1.0955	0.4998	1.2349	1.1458	0.7670	1.5985	0.5743	0.5874	0.6868
6.	BAO	0.3579	0.7429	0.0627	0.3047	0.2171	0.2599	0.3751	0.4265	0.1087	0.2596
7.	BAS	0.5342	0.9901	0.5686	0.9882	0.9457	1.1679	1.5088	0.5321	0.5473	0.5462
8.	BIE	0.3511	1.3548	0.5278	0.9449	0.4695	0.5403	0.7713	0.4270	0.4455	0.4747
9.	BKO	0.4872	0.9768	0.4858	0.5317	0.2847	0.5285	0.5061	0.7154	0.2193	0.7151
10.	BUS	1.7516	3.2326	1.9314	2.3010	2.3621	2.4986	2.3416	1.2245	2.1246	1.3296
11.	CHO	0.2660	1.6604	0.5235	0.6924	0.2496	0.4765	0.4472	0.4326	0.4412	0.4663
12.	CUA	0.3493	1.1673	0.5675	0.4273	0.7631	1.1554	1.0352	0.5647	0.5404	0.7057
13.	DOG2	0.5167	1.1139	0.0760	0.5454	0.2956	0.1844	0.7913	0.6059	0.2549	0.2707
14.	DYO	0.5039	0.9257	0.1767	0.6600	0.3272	0.1622	0.7128	0.5317	0.1549	0.4686
15.	EFE	0.3297	0.8758	0.3738	0.5631	0.6081	0.9520	1.1789	0.4432	0.2686	0.4925
16.	EFE2	1.0076	1.3117	1.3394	1.1583	1.7033	2.1640	1.7355	0.7968	1.1330	1.2194
17.	FAL1	1.0833	1.7052	0.5624	1.1767	0.5789	0.6235	1.1257	1.0432	0.6571	0.7021
18.	FAL2	1.7343	0.9602	0.9475	1.4827	1.1074	1.3315	1.4701	1.7344	1.1223	0.9130
19.	FOU	0.3761	0.8726	0.1736	0.4760	0.2233	0.2679	0.4289	0.4547	0.1809	0.2085
20.	GIN	0.1937	1.4446	0.3845	0.5527	0.1401	0.4481	0.4075	0.2842	0.2617	0.3538
21.	HEH	0.0000	1.0670	0.3680	0.2763	0.2545	0.7937	0.5475	0.2659	0.2393	0.3939
22.	KIR	1.0670	0.0000	0.8011	0.8973	1.1699	1.5364	1.4950	1.3323	0.7249	1.0394
23.	KUR	0.3680	0.8011	0.0000	0.3680	0.2877	0.2760	0.6710	0.4755	0.1298	0.2470
24.	LES	0.2763	0.8973	0.3680	0.0000	0.3091	0.9598	0.5289	0.6980	0.2295	0.6734
25.	LUI	0.2545	1.1699	0.2877	0.3091	0.0000	0.4748	0.3561	0.5347	0.2096	0.3437
26.	MAN	0.7937	1.5364	0.2760	0.9598	0.4748	0.0000	0.7068	0.6176	0.4171	0.4890
27.	MER	0.5475	1.4950	0.6710	0.5289	0.3561	0.7068	0.0000	0.5470	0.5295	0.6535
28.	NOB	0.2659	1.3323	0.4755	0.6980	0.5347	0.6176	0.5470	0.0000	0.3681	0.3608
29.	PEO	0.2393	0.7249	0.1298	0.2295	0.2096	0.4171	0.5295	0.3681	0.0000	0.4000
30.	SAS	0.3939	1.0394	0.2470	0.6734	0.3437	0.4890	0.6535	0.3608	0.4000	0.0000
31.	SON	0.9740	1.6874	0.9991	1.2853	0.5831	0.6151	0.5679	0.8904	0.7064	0.9878
32.	SHA	0.1759	0.9651	0.2489	0.4345	0.2688	0.4520	0.5369	0.1084	0.1301	0.3001
33.	TSW	0.0732	1.0059	0.3580	0.4124	0.4151	0.7928	0.6401	0.1388	0.2999	0.2685
34.	VEN	0.3931	1.2736	0.1907	0.5802	0.2321	0.2501	0.5941	0.3710	0.1533	0.3106
35.	YOR	0.4253	0.8909	0.1978	0.7350	0.4026	0.3385	0.5952	0.3121	0.3368	0.1811

C-4. Continued.

	TRIBE	31.	32.	33.	34.	35.
1.	AKA	1.5338	0.4040	0.1603	0.5757	0.6088
2.	BAB	0.5977	0.3479	0.6071	0.2568	0.5048
3.	BAG	0.8265	0.1773	0.4284	0.1840	0.2041
4.	BAK	0.7724	0.3459	0.6110	0.4490	0.7257
5.	BAM	1.5124	0.5490	0.5708	0.5827	0.5191
6.	BAO	0.7116	0.2367	0.3650	0.2095	0.1874
7.	BAS	1.6622	0.4792	0.3823	0.5604	0.5279
8.	BIE	0.5081	0.3919	0.4268	0.3149	0.4052
9.	BKO	0.2657	0.4414	0.6856	0.3375	0.6355
10.	BUS	3.5296	1.6909	1.2384	1.8887	1.6685
11.	CHO	0.4762	0.3799	0.4124	0.3403	0.5033
12.	CUA	1.8356	0.4774	0.2650	0.9195	0.7223
13.	DOG2	0.9909	0.3347	0.5097	0.2462	0.2960
14.	DYO	0.4886	0.2689	0.5756	0.1534	0.2863
15.	EFE	1.3996	0.2846	0.2924	0.3620	0.5547
16.	EFE2	2.6359	0.9064	0.6586	1.5906	1.2780
17.	FAL1	1.1409	0.7167	1.1001	0.4237	0.5332
18.	FAL2	1.6421	1.3302	1.6618	1.1088	0.9159
19.	FOU	0.5082	0.3015	0.3917	0.1898	0.2604
20.	GIN	0.4773	0.1899	0.2950	0.1579	0.3207
21.	HEH	0.9740	0.1759	0.0732	0.3931	0.4253
22.	KIR	1.6874	0.9651	1.0059	1.2736	0.8909
23.	KUR	0.9991	0.2489	0.3580	0.1907	0.1978
24.	LES	1.2853	0.4345	0.4124	0.5802	0.7350
25.	LUI	0.5831	0.2688	0.4151	0.2321	0.4026
26.	MAM	0.6151	0.4520	0.7928	0.2501	0.3385
27.	MER	0.5679	0.5369	0.6401	0.5941	0.5952
28.	NOB	0.8904	0.1084	0.1388	0.3710	0.3121
29.	PED	0.7064	0.1301	0.2999	0.1533	0.3368
30.	SAS	0.9878	0.3001	0.2685	0.3106	0.1811
31.	SON	0.0000	0.7366	1.1468	0.5973	0.8099
32.	SHA	0.7366	0.0000	0.1440	0.2137	0.2349
33.	TSW	1.1468	0.1440	0.0000	0.4341	0.3266
34.	VEN	0.5973	0.2137	0.4341	0.0000	0.3000
35.	YOR	0.8099	0.2349	0.3266	0.3000	0.0000

C-5. Male Palmar Interdigital Ridge-Count Distance Matrix.

TRIBE	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. AKA	0.0000	1.3250	0.2492	0.4035	0.2268	0.4992	0.4226	0.3675	0.7608	0.6394
2. AOY	1.3250	0.0000	0.6538	0.6409	1.0541	0.4462	0.4526	0.9900	0.4129	0.1871
3. ASY	0.2492	0.6538	0.0000	0.1283	0.3279	0.2201	0.2362	0.5378	0.3367	0.3277
4. BAG	0.4035	0.6409	0.1283	0.0000	0.2028	0.2466	0.0965	0.4216	0.1395	0.2867
5. BAK	0.2268	1.0541	0.3279	0.2028	0.0000	0.4379	0.1418	0.1223	0.3403	0.5167
6. BAM	0.4992	0.4462	0.2201	0.2466	0.4379	0.0000	0.1893	0.6066	0.1882	0.2424
7. BAO	0.4226	0.4526	0.2362	0.0965	0.1418	0.1893	0.0000	0.2325	0.0980	0.1566
8. BAS	0.3675	0.9900	0.5378	0.4216	0.1223	0.6066	0.2325	0.0000	0.4937	0.4956
9. BEO	0.7608	0.4129	0.3367	0.1395	0.3403	0.1882	0.0980	0.4937	0.0000	0.2973
10. BIE	0.6394	0.1871	0.3277	0.2867	0.5167	0.2424	0.1566	0.4956	0.2973	0.0000
11. BOZ	0.4429	0.6037	0.2574	0.1014	0.1968	0.2939	0.0643	0.4124	0.2106	0.2275
12. BUS	1.2433	1.1546	1.1186	0.6047	0.5185	0.9634	0.4612	0.4066	0.4647	0.8101
13. BWA	0.6014	0.4793	0.1812	0.1909	0.6137	0.1754	0.2879	0.9024	0.3272	0.2280
14. CHO	0.7583	0.4384	0.3234	0.2591	0.7361	0.2078	0.3374	0.9232	0.3511	0.1943
15. CUA	0.7803	0.2328	0.4529	0.3193	0.4870	0.1300	0.1287	0.5108	0.1420	0.1156
16. DOG1	0.8541	0.1624	0.4132	0.3144	0.4988	0.2276	0.1303	0.5721	0.1369	0.1460
17. DOG3	0.7693	1.0310	0.6482	0.2981	0.2896	0.5998	0.2301	0.5894	0.3533	0.5824
18. DYO	1.0592	0.2459	0.5400	0.2883	0.5384	0.4077	0.1769	0.5305	0.1018	0.2361
19. EFE2	0.7921	2.2245	1.2160	0.8807	0.5425	1.6618	0.8825	0.5539	1.3706	1.2634
20. FAL1	0.1359	1.0833	0.2737	0.1742	0.0583	0.4146	0.1778	0.1829	0.4267	0.4469
21. FAL2	0.7084	0.5513	0.3513	0.2605	0.3506	0.3173	0.2157	0.3703	0.1233	0.4520
22. FAL3	0.8617	1.1223	0.7160	0.4904	0.2001	0.9132	0.3625	0.4008	0.4644	0.8459
23. FOU	1.0910	0.3050	0.5686	0.3670	0.6423	0.2461	0.2244	0.8454	0.1321	0.3014
24. FUL	1.2753	0.5014	0.9501	0.7018	0.7026	0.9855	0.4186	0.4832	0.5721	0.4293
25. GIN	0.8048	0.1878	0.2999	0.3087	0.6680	0.1332	0.2372	0.8503	0.2311	0.1446
26. HEH	0.5927	0.5861	0.1928	0.1822	0.6389	0.2175	0.3477	0.8624	0.3578	0.2829
27. KUR	0.8168	0.5149	0.5640	0.2664	0.2989	0.5599	0.1181	0.2794	0.2174	0.2771
28. KUS	1.6180	0.6338	0.8540	0.4545	0.9222	0.8093	0.4960	1.2116	0.3173	0.6601
29. LES	0.2738	0.6193	0.1187	0.1117	0.3041	0.1599	0.1535	0.5101	0.3127	0.1800
30. LUI	1.1391	0.0237	0.4811	0.5306	0.9494	0.3379	0.4052	0.9343	0.3512	0.1809
31. MAN	0.5345	0.4312	0.2203	0.1343	0.2658	0.1944	0.0672	0.4855	0.1239	0.2243
32. MAN	0.4912	0.4286	0.3954	0.3168	0.3092	0.2632	0.0985	0.3490	0.3202	0.1137
33. MER	1.7796	0.8693	0.9292	0.5866	1.0512	1.1411	0.7128	1.3186	0.4950	0.9619
34. NDB	0.6772	0.8990	0.7012	0.4637	0.5680	0.6811	0.3861	0.5548	0.7087	0.3020
35. PEO	0.7817	0.2876	0.3826	0.2122	0.5610	0.2049	0.1709	0.6561	0.1990	0.0847
36. SAS	0.7491	0.5104	0.3018	0.1739	0.3366	0.4581	0.1815	0.4432	0.1398	0.4087
37. SDN	0.7665	0.3648	0.3047	0.1764	0.5720	0.2004	0.1984	0.8242	0.2059	0.1723
38. SHA	1.0540	0.1409	0.5742	0.4638	0.8437	0.3306	0.3126	0.8734	0.3750	0.0739
39. SUK	0.6215	0.4548	0.3894	0.1615	0.3154	0.1858	0.0677	0.4316	0.1310	0.1514
40. TAN	1.0670	0.2734	0.4817	0.2484	0.6816	0.2988	0.2489	0.7640	0.1249	0.2247
41. TSW	0.8331	0.3446	0.5772	0.6027	0.8784	0.3567	0.4239	0.8830	0.6386	0.1127
42. VEN	0.8872	0.2817	0.5698	0.4109	0.6944	0.2820	0.2579	0.6827	0.3533	0.0762
43. YOR	0.7154	0.4578	0.3938	0.1179	0.3295	0.2858	0.0752	0.4710	0.1088	0.1854

C-5. Continued.

	TRIBE	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
1.	AKA	0.4429	1.2433	0.6014	0.7583	0.7803	0.8541	0.7693	1.0592	0.7921	0.1359
2.	AOY	0.6037	1.1546	0.4793	0.4384	0.2320	0.1624	1.0310	0.2459	2.2245	1.0833
3.	ASY	0.2574	1.1186	0.1812	0.3234	0.4529	0.4132	0.6482	0.5400	1.2160	0.2737
4.	BAG	0.1014	0.6047	0.1909	0.2591	0.3193	0.3144	0.2981	0.2883	0.8807	0.1742
5.	BAK	0.1968	0.5185	0.6137	0.7361	0.4870	0.4988	0.2896	0.5384	0.5425	0.0583
6.	BAM	0.2939	0.9634	0.1754	0.2078	0.1300	0.2276	0.5998	0.4077	1.6618	0.4146
7.	BAO	0.0643	0.4612	0.2879	0.3374	0.1287	0.1303	0.2301	0.1769	0.8825	0.1778
8.	BAS	0.4124	0.4066	0.9024	0.9232	0.5108	0.5721	0.5894	0.5305	0.5539	0.1829
9.	BEO	0.2106	0.4647	0.3272	0.3511	0.1420	0.1369	0.3533	0.1018	1.3706	0.4267
10.	BIE	0.2275	0.8101	0.2280	0.1943	0.1156	0.1460	0.5824	0.2361	1.2634	0.4469
11.	BOZ	0.0000	0.6866	0.2255	0.3401	0.2631	0.2124	0.1147	0.3290	0.8065	0.1990
12.	BUS	0.6866	0.0000	1.2412	1.0827	0.6313	0.7623	0.6391	0.3864	0.8742	0.6184
13.	BWA	0.2255	1.2412	0.0000	0.0655	0.3124	0.3283	0.5593	0.4975	1.5513	0.4876
14.	CHO	0.3401	1.0827	0.0655	0.0000	0.2626	0.3893	0.6955	0.4468	1.5999	0.5554
15.	CUA	0.2631	0.6313	0.3124	0.2626	0.0000	0.0829	0.4909	0.1709	1.5238	0.5048
16.	DOG1	0.2124	0.7623	0.3283	0.3893	0.0829	0.0000	0.4315	0.1336	1.5693	0.5950
17.	DOG3	0.1147	0.6391	0.5593	0.6955	0.4909	0.4315	0.0000	0.5164	0.7910	0.3611
18.	DYO	0.3290	0.3864	0.4975	0.4468	0.1709	0.1336	0.5164	0.0000	1.3941	0.6259
19.	EFE2	0.8065	0.8742	1.5513	1.5999	1.5238	1.5693	0.7910	1.3941	0.0000	0.4586
20.	FAL1	0.1990	0.6184	0.4876	0.5554	0.5048	0.5950	0.3611	0.6259	0.4586	0.0000
21.	FAL2	0.4580	0.4715	0.6028	0.6189	0.3215	0.3192	0.7137	0.2025	1.4206	0.4731
22.	FAL3	0.4113	0.6135	1.0694	1.3001	0.7842	0.5433	0.3874	0.5281	0.8879	0.5428
23.	FOU	0.2626	0.8312	0.3275	0.3767	0.1203	0.0744	0.3744	0.2095	1.8307	0.7375
24.	FUL	0.5667	0.5436	1.0621	1.0487	0.5383	0.3874	0.7514	0.2681	1.1321	0.8434
25.	GIN	0.2582	1.1559	0.1116	0.1770	0.1388	0.0992	0.5831	0.3139	1.8481	0.6561
26.	HEH	0.3557	1.1009	0.0708	0.0444	0.3795	0.4909	0.7424	0.5133	1.4825	0.4564
27.	KUR	0.1987	0.2676	0.6153	0.6171	0.2856	0.2274	0.2866	0.1195	0.7718	0.3855
28.	KUS	0.4393	0.8280	0.6090	0.6736	0.5850	0.3960	0.4466	0.2801	1.7363	1.0357
29.	LES	0.1211	0.9516	0.0840	0.1439	0.2825	0.3474	0.4039	0.4938	1.0099	0.1826
30.	LUI	0.5564	1.1812	0.3753	0.3667	0.2297	0.1595	1.0184	0.2547	2.1861	0.9699
31.	MAM	0.0556	0.7851	0.2116	0.3584	0.1924	0.0933	0.2160	0.2563	1.1942	0.3355
32.	MAN	0.1222	0.7706	0.3446	0.4005	0.1422	0.1501	0.3225	0.3578	1.0236	0.3120
33.	MER	0.6956	0.9747	0.9222	1.0534	0.9595	0.6460	0.7613	0.4206	1.8360	1.2333
34.	NOB	0.3522	0.7580	0.5381	0.4196	0.4971	0.6769	0.5513	0.6599	0.6376	0.3584
35.	PED	0.2117	0.6982	0.1506	0.0727	0.1010	0.1932	0.4680	0.2055	1.3397	0.4666
36.	SAS	0.2853	0.5533	0.5089	0.6161	0.4086	0.2533	0.4918	0.1591	1.1789	0.4683
37.	SDN	0.1462	0.9527	0.0553	0.0894	0.1904	0.1838	0.3700	0.3028	1.4562	0.5033
38.	SHA	0.3485	1.0139	0.2584	0.1924	0.1348	0.1669	0.6657	0.2865	1.7225	0.7681
39.	SUK	0.1087	0.4854	0.2414	0.2075	0.0806	0.1737	0.2385	0.2058	1.0475	0.2863
40.	TAN	0.3645	0.5704	0.2951	0.1897	0.1659	0.2260	0.6077	0.0948	1.5995	0.6550
41.	TSW	0.4374	1.3460	0.2960	0.2427	0.2539	0.3558	0.8412	0.6106	1.6841	0.7186
42.	VEN	0.3331	0.7823	0.2919	0.1629	0.0984	0.2429	0.6165	0.3006	1.4491	0.5816
43.	YOR	0.0888	0.4288	0.2574	0.2411	0.1500	0.1795	0.1930	0.1436	0.9717	0.3190

C-5. Continued.

	TRIBE	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
1.	AKA	0.7084	0.8617	1.0910	1.2753	0.8048	0.5927	0.8168	1.6180	0.2738	1.1391
2.	AOY	0.5513	1.1223	0.3050	0.5014	0.1878	0.5861	0.5149	0.6338	0.6193	0.0237
3.	ASY	0.3513	0.7160	0.5686	0.9501	0.2999	0.1928	0.5640	0.8540	0.1187	0.4811
4.	BAB	0.2605	0.4904	0.3670	0.7018	0.3087	0.1822	0.2664	0.4545	0.1117	0.5306
5.	BAK	0.3506	0.2801	0.6423	0.7026	0.6680	0.6389	0.2909	0.9222	0.3041	0.9494
6.	BAN	0.3173	0.9132	0.2461	0.9855	0.1332	0.2175	0.5599	0.8093	0.1599	0.3379
7.	BAU	0.2157	0.3625	0.2244	0.4186	0.2372	0.3477	0.1181	0.4960	0.1535	0.4052
8.	BAS	0.3703	0.4008	0.8454	0.4832	0.8503	0.8624	0.2794	1.2116	0.5101	0.9343
9.	BEU	0.1233	0.4644	0.1321	0.5721	0.2311	0.3578	0.2174	0.3173	0.3127	0.3512
10.	BIE	0.4520	0.8459	0.3014	0.4293	0.1446	0.2829	0.2771	0.6601	0.1880	0.1809
11.	BOZ	0.4580	0.4113	0.2626	0.5667	0.2582	0.3557	0.1987	0.4393	0.1211	0.5564
12.	BUS	0.4715	0.6135	0.8312	0.5436	1.1559	1.1009	0.2676	0.8280	0.9516	1.1812
13.	BWA	0.6028	1.0694	0.3275	1.0621	0.1116	0.0708	0.6153	0.6090	0.0840	0.3753
14.	CHO	0.6189	1.3001	0.3767	1.0487	0.1770	0.0444	0.6171	0.6736	0.1439	0.3667
15.	CUA	0.3215	0.7842	0.1203	0.5383	0.1388	0.3795	0.2856	0.5850	0.2825	0.2297
16.	DOG1	0.3192	0.5433	0.0744	0.3874	0.0992	0.4909	0.2274	0.3960	0.3474	0.1595
17.	DOG3	0.7137	0.3874	0.3744	0.7514	0.5831	0.7424	0.2866	0.4466	0.4099	1.0184
18.	DYO	0.2025	0.5281	0.2095	0.2681	0.3139	0.5133	0.1195	0.2801	0.4938	0.2547
19.	EFE2	1.4206	0.8879	1.8307	1.1321	1.8481	1.4825	0.7718	1.7363	1.0099	2.1861
20.	FAL1	0.4731	0.5428	0.7375	0.8434	0.6561	0.4564	0.3855	1.0357	0.1826	0.9699
21.	FAL2	0.0000	0.4663	0.4492	0.5955	0.4803	0.5341	0.3310	0.6788	0.5026	0.4427
22.	FAL3	0.4663	0.0000	0.7129	0.4805	0.9232	1.2249	0.2842	0.6853	0.8280	1.0701
23.	FOU	0.4492	0.7129	0.0000	0.6722	0.1257	0.5095	0.3622	0.2929	0.4182	0.3050
24.	FUL	0.5955	0.4805	0.6722	0.0000	0.7702	1.1526	0.1480	0.6928	0.8992	0.5889
25.	GIN	0.4803	0.9232	0.1257	0.7702	0.0000	0.2602	0.4937	0.5145	0.2229	0.1380
26.	HEH	0.5341	1.2249	0.5095	1.1526	0.2602	0.0000	0.6681	0.7515	0.1182	0.4576
27.	KUR	0.3310	0.2842	0.3622	0.1480	0.4937	0.6681	0.0000	0.3947	0.4554	0.5403
28.	KUS	0.6788	0.6853	0.2929	0.6928	0.5145	0.7515	0.3947	0.0000	0.7671	0.6473
29.	LES	0.5026	0.8280	0.4182	0.8992	0.2229	0.1182	0.4554	0.7671	0.0000	0.5148
30.	LUI	0.4427	1.0701	0.3050	0.5889	0.1380	0.4576	0.5403	0.6473	0.5148	0.0000
31.	MAN	0.3267	0.3824	0.1406	0.5632	0.1402	0.3754	0.2411	0.3875	0.1784	0.3693
32.	MAN	0.5262	0.5974	0.2789	0.4588	0.2322	0.4999	0.2437	0.7413	0.1997	0.4298
33.	MER	0.6767	0.6070	0.6463	0.7477	0.8339	1.0184	0.5364	0.1384	1.0690	0.8336
34.	NOB	0.9771	1.1542	0.7977	0.7537	0.6871	0.5103	0.4392	1.0460	0.3163	0.9245
35.	PED	0.4565	0.9447	0.2048	0.6300	0.1425	0.1659	0.3089	0.4624	0.1704	0.2750
36.	SAS	0.1240	0.2496	0.3918	0.4040	0.4230	0.5376	0.1945	0.3656	0.4562	0.4257
37.	SON	0.5377	0.8807	0.1526	0.7960	0.0805	0.1575	0.4022	0.3553	0.1382	0.3203
38.	SHA	0.6799	1.1368	0.2216	0.5844	0.1221	0.3688	0.4217	0.5686	0.3369	0.1785
39.	SUK	0.3779	0.6593	0.1702	0.5736	0.2177	0.2865	0.1985	0.4677	0.1596	0.4409
40.	TAN	0.3068	0.9043	0.2140	0.6102	0.2351	0.2532	0.3119	0.3175	0.3726	0.2518
41.	TSW	0.9289	1.4196	0.4730	0.8536	0.2268	0.4103	0.6635	1.0553	0.2934	0.3594
42.	VEN	0.6194	1.1459	0.2910	0.6250	0.2159	0.3211	0.3844	0.7041	0.2744	0.3118
43.	YOR	0.3609	0.5480	0.1762	0.4823	0.2509	0.3016	0.1291	0.2908	0.2027	0.4472

C-5. Continued.

	TRIBE	31.	32.	33.	34.	35.	36.	37.	38.	39.	40.
1.	AKA	0.5345	0.4912	1.7796	0.6772	0.7817	0.7491	0.7665	1.0540	0.6215	1.0670
2.	ADY	0.4312	0.4286	0.8693	0.8990	0.2876	0.5104	0.3648	0.1409	0.4540	0.2734
3.	ASY	0.2203	0.3954	0.9292	0.7012	0.0826	0.3018	0.3047	0.5742	0.3894	0.4817
4.	BAG	0.1343	0.3168	0.5866	0.4617	0.2122	0.1730	0.1764	0.4608	0.1615	0.2484
5.	BAK	0.2658	0.3092	1.0512	0.5680	0.5610	0.3966	0.5720	0.8437	0.3154	0.6816
6.	BAM	0.1944	0.2632	1.1411	0.6811	0.2049	0.4581	0.2004	0.3306	0.1858	0.2988
7.	BAO	0.0672	0.0985	0.7128	0.3861	0.1709	0.1815	0.1984	0.3126	0.0677	0.2489
8.	BAS	0.4855	0.3430	1.3186	0.5548	0.6561	0.4432	0.8242	0.8734	0.4316	0.7640
9.	BEO	0.1239	0.3202	0.4950	0.7087	0.1990	0.1390	0.2059	0.3750	0.1310	0.1249
10.	BIE	0.2243	0.1137	0.9619	0.3020	0.0847	0.4087	0.1723	0.0739	0.1514	0.2247
11.	BOZ	0.0556	0.1222	0.6956	0.3522	0.2117	0.2053	0.1462	0.3485	0.1087	0.3645
12.	BUS	0.7851	0.7706	0.9747	0.7580	0.6982	0.5533	0.9527	1.0139	0.4854	0.5704
13.	BWA	0.2116	0.3446	0.9222	0.5381	0.1506	0.5089	0.0553	0.2584	0.2414	0.2951
14.	CHO	0.3584	0.4005	1.0534	0.4196	0.0727	0.6161	0.0894	0.1924	0.2075	0.1897
15.	CUA	0.1924	0.1422	0.9595	0.4971	0.1010	0.4086	0.1904	0.1348	0.0806	0.1659
16.	DOG1	0.0933	0.1501	0.6460	0.6769	0.1932	0.2543	0.1898	0.1669	0.1737	0.2260
17.	DOG3	0.2160	0.3225	0.7613	0.5513	0.4680	0.4918	0.3700	0.6657	0.2385	0.6077
18.	DYO	0.2563	0.3578	0.4206	0.6599	0.2055	0.1591	0.3028	0.2865	0.2058	0.0948
19.	EFE2	1.1942	1.0236	1.8360	0.6376	1.3397	1.1789	1.4562	1.7275	1.0475	1.5995
20.	FAL1	0.3355	0.3120	1.2333	0.3504	0.4666	0.4603	0.5033	0.7681	0.2863	0.6550
21.	FAL2	0.3267	0.5262	0.6767	0.9771	0.4565	0.1240	0.5377	0.6799	0.3779	0.3068
22.	FAL3	0.3824	0.5974	0.6070	1.1542	0.9447	0.2496	0.8807	1.1368	0.6593	0.9043
23.	FOU	0.1406	0.2789	0.6463	0.7977	0.2048	0.3938	0.1526	0.2716	0.1702	0.2140
24.	FUL	0.5632	0.4588	0.7477	0.7537	0.6300	0.4040	0.7960	0.5844	0.5736	0.6102
25.	GIN	0.1402	0.2322	0.8339	0.6871	0.1425	0.4230	0.0805	0.1221	0.2177	0.2351
26.	HEH	0.3754	0.4999	1.0184	0.5103	0.1659	0.5376	0.1575	0.3688	0.2865	0.2532
27.	KUR	0.2411	0.2437	0.5364	0.4392	0.3089	0.1945	0.4022	0.4217	0.1985	0.3119
28.	KUS	0.3875	0.7413	0.1384	1.0460	0.4624	0.3656	0.3553	0.5606	0.4677	0.3175
29.	LES	0.1784	0.1997	1.0690	0.3163	0.1704	0.4562	0.1382	0.3369	0.1596	0.3726
30.	LUI	0.3693	0.4298	0.8336	0.9245	0.2750	0.4257	0.3203	0.1785	0.4409	0.2518
31.	MAM	0.0000	0.1427	0.5994	0.6015	0.2307	0.1979	0.1372	0.3186	0.1476	0.3157
32.	MAN	0.1427	0.0000	1.1063	0.3181	0.2169	0.4658	0.2510	0.2214	0.1282	0.4413
33.	MER	0.5994	1.1063	0.0000	1.4905	0.8308	0.2976	0.6998	0.9893	0.8423	0.5598
34.	NOB	0.6015	0.3181	1.4905	0.0000	0.2971	0.8865	0.4555	0.4303	0.2773	0.5861
35.	PED	0.2307	0.2169	0.8308	0.2971	0.0000	0.4340	0.0657	0.0814	0.0649	0.0850
36.	SAS	0.1979	0.4658	0.2976	0.8865	0.4340	0.0000	0.4137	0.6077	0.3754	0.3125
37.	SON	0.1372	0.2510	0.6998	0.4555	0.0657	0.4137	0.0000	0.1454	0.1196	0.1681
38.	SHA	0.3186	0.2214	0.9893	0.4303	0.0814	0.6077	0.1454	0.0000	0.2010	0.2113
39.	SUK	0.1476	0.1282	0.8423	0.2773	0.0649	0.3754	0.1196	0.2010	0.0000	0.1680
40.	TAN	0.3157	0.4413	0.5598	0.5861	0.0850	0.3125	0.1681	0.2113	0.1680	0.0000
41.	TSW	0.4564	0.2107	1.5681	0.3617	0.2015	0.9089	0.2777	0.1014	0.3150	0.4921
42.	VEN	0.3634	0.1934	1.1717	0.2603	0.0491	0.6495	0.1844	0.0546	0.1179	0.1996
43.	YOR	0.1359	0.1934	0.5823	0.3124	0.0815	0.2698	0.1112	0.2333	0.0301	0.1309

C-5. Continued.

	TRIBE	41.	42.	43.
1.	AKA	0.8331	0.8872	0.7154
2.	ADY	0.3446	0.2817	0.4578
3.	ASY	0.5772	0.5698	0.3938
4.	BAG	0.6027	0.4109	0.1179
5.	BAK	0.8784	0.6944	0.3295
6.	BAN	0.3567	0.2820	0.2858
7.	BAO	0.4239	0.2579	0.0752
8.	BAS	0.8830	0.6827	0.4710
9.	BEO	0.6386	0.3533	0.1088
10.	BIE	0.1127	0.0762	0.1854
11.	BOZ	0.4374	0.3331	0.0888
12.	BUS	1.3460	0.7823	0.4288
13.	BWA	0.2960	0.2919	0.2574
14.	CHO	0.2427	0.1629	0.2411
15.	CUA	0.2539	0.0984	0.1500
16.	DOG1	0.3558	0.2429	0.1795
17.	DOG3	0.8412	0.6165	0.1930
18.	DYO	0.6106	0.3006	0.1436
19.	EFE2	1.6841	1.4491	0.9717
20.	FAL1	0.7186	0.5816	0.3190
21.	FAL2	0.9289	0.6194	0.3609
22.	FAL3	1.4196	1.1459	0.5400
23.	FOU	0.4730	0.2910	0.1762
24.	FUL	0.8536	0.6250	0.4823
25.	GIN	0.2268	0.2159	0.2509
26.	HEH	0.4103	0.3211	0.3016
27.	KUR	0.6635	0.3844	0.1291
28.	KUS	1.0553	0.7041	0.2908
29.	LES	0.2934	0.2744	0.2027
30.	LUI	0.3594	0.3118	0.4472
31.	MAN	0.4564	0.3634	0.1359
32.	MAN	0.2107	0.1934	0.1934
33.	MER	1.5681	1.1717	0.5823
34.	NDB	0.3617	0.2603	0.3124
35.	PEO	0.2015	0.0491	0.0815
36.	SAS	0.9089	0.6495	0.2698
37.	SDN	0.2777	0.1844	0.1112
38.	SHA	0.1014	0.0546	0.2333
39.	SUK	0.3150	0.1179	0.0301
40.	TAN	0.4921	0.1996	0.1309
41.	TSW	0.0000	0.1064	0.4263
42.	VEN	0.1064	0.0000	0.1851
43.	YOR	0.4263	0.1851	0.0000

C-6. **Female Palmar Interdigital Ridge-Count Distance Matrix.**

	TRIBE	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1.	AKA	0.0000	0.6980	2.4504	0.7907	0.5010	0.1902	1.0211	1.8308	1.1367	0.9786
2.	BAG	0.6980	0.0000	0.7153	0.1122	0.0923	0.3948	0.3343	0.9738	0.2131	0.1996
3.	BAK	2.4504	0.7153	0.0000	0.8169	0.8791	1.8153	1.0684	1.4779	0.5070	0.5999
4.	BAM	0.7907	0.1122	0.8169	0.0000	0.0924	0.5928	0.0938	1.1420	0.2543	0.1820
5.	BAO	0.5010	0.0923	0.8791	0.0924	0.0000	0.2732	0.2958	0.8358	0.1745	0.2076
6.	BAS	0.1902	0.3948	1.8153	0.5928	0.2732	0.0000	0.9618	0.9312	0.6391	0.7925
7.	BIE	1.0211	0.3343	1.0684	0.0938	0.2958	0.9618	0.0000	1.5607	0.4467	0.1997
8.	BUS	1.8308	0.9738	1.4779	1.1420	0.8358	0.9312	1.5607	0.0000	0.4753	1.2279
9.	BWA	1.1367	0.2131	0.5070	0.2543	0.1745	0.6391	0.4467	0.4753	0.0000	0.1957
10.	CHO	0.9786	0.1996	0.5999	0.1820	0.2076	0.7925	0.1997	1.2279	0.1957	0.0000
11.	CUA	1.9550	0.5127	0.3536	0.3091	0.5738	1.5902	0.3191	1.5521	0.4162	0.3386
12.	DOG3	0.8906	0.4335	1.2259	0.4525	0.2640	0.3717	0.8600	0.4126	0.3539	0.8204
13.	DYO	0.9036	0.3477	0.9231	0.2276	0.1329	0.5609	0.3609	0.5785	0.1184	0.2839
14.	FAL1	0.7776	0.0922	1.0477	0.1849	0.1858	0.3803	0.4758	0.8680	0.3565	0.5012
15.	FAL2	1.3478	0.3134	0.7963	0.5644	0.4344	0.6699	0.8511	0.3587	0.1697	0.4980
16.	FOU	1.2939	0.2263	0.5918	0.3269	0.3487	0.7692	0.5348	0.6789	0.1726	0.3825
17.	GIN	1.1284	0.2009	0.5859	0.1716	0.1653	0.6979	0.2826	0.6084	0.0257	0.1367
18.	HEH	0.8179	0.1422	0.7781	0.0391	0.1431	0.7003	0.0569	1.3372	0.2783	0.0791
19.	KUR	1.0576	0.1940	0.7518	0.2332	0.1773	0.5080	0.5020	0.3829	0.0927	0.4117
20.	LES	0.9987	0.3031	0.8918	0.3478	0.1870	0.4647	0.5954	0.2624	0.0698	0.3940
21.	LUI	1.3873	0.3532	0.7505	0.1690	0.3597	1.1685	0.1090	1.4641	0.3592	0.1450
22.	MAL	0.8174	1.0164	1.6305	0.7656	0.5604	0.9617	0.8664	1.9114	0.9221	0.7674
23.	MAM	1.4105	0.2466	0.3707	0.3551	0.4191	0.9980	0.6864	1.5012	0.4985	0.4952
24.	MER	1.5540	0.5901	1.0837	0.3431	0.4301	1.0375	0.4486	0.6170	0.3039	0.6321
25.	NDB	1.0301	0.2815	0.5080	0.2133	0.2196	0.7746	0.3595	1.0717	0.2156	0.2451
26.	PED	1.3934	0.4281	0.5938	0.2660	0.3659	1.1848	0.2012	1.3570	0.2681	0.0741
27.	SAS	1.6788	0.2880	0.5641	0.3593	0.4191	0.9883	0.5832	0.6097	0.1806	0.4338
28.	SON	1.2429	0.7054	0.8959	0.4525	0.4082	1.1300	0.5374	1.5701	0.5415	0.4334
29.	SHA	0.7104	0.1631	0.8809	0.0825	0.1035	0.5784	0.1050	1.1436	0.2184	0.0564
30.	TSW	1.2606	0.2739	0.4894	0.3972	0.3198	0.7747	0.5559	0.6225	0.0677	0.2037
31.	VEN	1.4217	0.6246	1.0404	0.2601	0.4712	1.3022	0.1235	1.4914	0.4722	0.3434
32.	YOR	0.8031	0.2644	1.0049	0.2681	0.2026	0.5643	0.2921	0.8269	0.1654	0.1200

C-6. Continued.

	TRIBE	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
1.	AKA	1.9550	0.8906	0.9036	0.7776	1.3478	1.2939	1.1284	0.8179	1.0576	0.9987
2.	BAB	0.5127	0.4335	0.3477	0.0922	0.3134	0.2263	0.2009	0.1422	0.1940	0.3031
3.	BAK	0.3536	1.2259	0.9231	1.0477	0.7963	0.5918	0.5859	0.7781	0.7518	0.8918
4.	BAN	0.3091	0.4525	0.2276	0.1849	0.5644	0.3269	0.1716	0.0391	0.2332	0.3478
5.	BAO	0.5738	0.2640	0.1329	0.1858	0.4344	0.3487	0.1653	0.1431	0.1773	0.1870
6.	BAS	1.5902	0.3717	0.5609	0.3803	0.6699	0.7692	0.6979	0.7003	0.5080	0.4647
7.	BIE	0.3191	0.8600	0.3609	0.4758	0.8511	0.5348	0.2826	0.0569	0.5020	0.5954
8.	BUS	1.5521	0.4126	0.5785	0.8680	0.3587	0.6789	0.6084	1.3372	0.3829	0.2624
9.	BWA	0.4162	0.3539	0.1184	0.3565	0.1697	0.1726	0.0257	0.2783	0.0927	0.0698
10.	CHO	0.3386	0.8204	0.2839	0.5012	0.4980	0.3825	0.1367	0.0791	0.4117	0.3940
11.	CUA	0.0000	1.0034	0.5597	0.7154	0.8571	0.4483	0.3315	0.2883	0.5386	0.7313
12.	DOG3	1.0034	0.0000	0.2875	0.2960	0.5050	0.4746	0.4272	0.6780	0.1523	0.2002
13.	DYO	0.5597	0.2875	0.0000	0.4465	0.4648	0.4394	0.1000	0.2850	0.1849	0.0900
14.	FAL1	0.7154	0.2960	0.4465	0.0000	0.3685	0.2843	0.3377	0.3215	0.1621	0.3398
15.	FAL2	0.8571	0.5050	0.4648	0.3685	0.0000	0.1657	0.2322	0.6102	0.1686	0.1868
16.	FOU	0.4483	0.4746	0.4394	0.2843	0.1657	0.0000	0.1946	0.3624	0.1281	0.3010
17.	GIN	0.3315	0.4272	0.1000	0.3377	0.2322	0.1946	0.0000	0.1812	0.1162	0.1048
18.	HEH	0.2883	0.6780	0.2850	0.3215	0.6102	0.3624	0.1812	0.0000	0.3550	0.4391
19.	KUR	0.5386	0.1523	0.1849	0.1621	0.1686	0.1281	0.1162	0.3550	0.0000	0.0773
20.	LES	0.7313	0.2002	0.0900	0.3398	0.1868	0.3010	0.1048	0.4391	0.0773	0.0000
21.	LUI	0.2288	0.9596	0.3572	0.5585	0.7597	0.5898	0.2164	0.1208	0.5155	0.5461
22.	MAL	1.2256	0.9905	0.5535	1.3309	1.7211	1.4717	0.9174	0.7453	1.1429	0.9613
23.	MAN	0.4159	0.7345	0.7480	0.3742	0.7340	0.4922	0.5282	0.4214	0.4961	0.7345
24.	MER	0.4942	0.3579	0.2047	0.5050	0.6023	0.4347	0.2391	0.4922	0.2045	0.2658
25.	NOB	0.2827	0.4978	0.2953	0.4752	0.5756	0.2309	0.2275	0.2075	0.2883	0.4043
26.	PED	0.2325	0.9836	0.2884	0.7526	0.7237	0.5570	0.1750	0.1608	0.5397	0.4938
27.	SAS	0.4425	0.5370	0.4048	0.2988	0.2008	0.2507	0.1673	0.4498	0.1621	0.2526
28.	SDN	0.5802	0.8448	0.3272	0.9965	1.2782	1.0780	0.5061	0.4491	0.7812	0.6663
29.	SHA	0.4272	0.6248	0.1799	0.3596	0.5376	0.4211	0.1333	0.0379	0.3359	0.3174
30.	TSW	0.4905	0.6041	0.3104	0.4951	0.1408	0.1237	0.1056	0.3497	0.2135	0.2126
31.	VEN	0.2683	0.9079	0.3424	0.7892	1.0069	0.5925	0.3241	0.2258	0.5696	0.6402
32.	YOR	0.6472	0.6518	0.1870	0.4720	0.3352	0.3573	0.1126	0.1997	0.3121	0.2177

C-6. Continued.

	TRIBE	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
1.	AKA	1.3873	0.8174	1.4105	1.5540	1.0301	1.3934	1.6788	1.2429	0.7104	1.2606
2.	BAG	0.3532	1.0164	0.2466	0.5901	0.2815	0.4281	0.2880	0.7054	0.1631	0.2739
3.	BAK	0.7505	1.6305	0.3707	1.0837	0.5080	0.5938	0.5641	0.8959	0.8809	0.4894
4.	BAM	0.1690	0.7656	0.3551	0.3431	0.2133	0.2660	0.3593	0.4525	0.0825	0.3972
5.	BAO	0.3597	0.5604	0.4191	0.4301	0.2196	0.3659	0.4191	0.4082	0.1035	0.3198
6.	BAS	1.1685	0.9617	0.9980	1.0375	0.7746	1.1848	0.9883	1.1300	0.5784	0.7747
7.	BIE	0.1090	0.8664	0.6864	0.4486	0.3595	0.2012	0.5832	0.5374	0.1050	0.5559
8.	BUS	1.4641	1.9114	1.5012	0.6170	1.0717	1.3570	0.6097	1.5701	1.1436	0.6225
9.	BWA	0.3592	0.9221	0.4985	0.3039	0.2156	0.2681	0.1806	0.5415	0.2184	0.0677
10.	CHO	0.1450	0.7674	0.4952	0.6321	0.2451	0.0741	0.4338	0.4334	0.0564	0.2037
11.	CUA	0.2288	1.2256	0.4159	0.4942	0.2827	0.2325	0.4425	0.5802	0.4272	0.4905
12.	DOG3	0.9596	0.9905	0.7345	0.3579	0.4978	0.9836	0.5370	0.8448	0.6248	0.6041
13.	DYO	0.3572	0.5535	0.7480	0.2047	0.2953	0.2884	0.4048	0.3272	0.1799	0.3104
14.	FAL1	0.5585	1.3309	0.3742	0.5050	0.4752	0.7526	0.2988	0.9965	0.3596	0.4951
15.	FAL2	0.7597	1.7211	0.7340	0.6023	0.5756	0.7237	0.2008	1.2782	0.5376	0.1408
16.	FOU	0.5898	1.4717	0.4922	0.4347	0.2309	0.5570	0.2507	1.0780	0.4211	0.1237
17.	GIN	0.2164	0.9174	0.5282	0.2391	0.2275	0.1750	0.1673	0.5061	0.1333	0.1056
18.	HEH	0.1208	0.7453	0.4214	0.4922	0.2075	0.1608	0.4498	0.4491	0.0379	0.3497
19.	KUR	0.5155	1.1429	0.4961	0.2045	0.2883	0.5397	0.1621	0.7812	0.3359	0.2135
20.	LES	0.5461	0.9613	0.7345	0.2658	0.4043	0.4938	0.2526	0.6663	0.3174	0.2126
21.	LUI	0.0000	0.9940	0.5645	0.4899	0.4588	0.0870	0.3865	0.4382	0.1329	0.4930
22.	MAL	0.9940	0.0000	1.2880	1.1724	0.6596	0.7594	1.6678	0.2258	0.6394	1.1777
23.	MAM	0.5645	1.2880	0.0000	0.9223	0.4088	0.6571	0.4540	0.7539	0.5574	0.6083
24.	MER	0.4899	1.1724	0.9223	0.0000	0.4678	0.5457	0.3605	0.7317	0.4782	0.5380
25.	NOB	0.4588	0.6596	0.4088	0.4678	0.0000	0.3200	0.5568	0.4639	0.2737	0.2429
26.	PED	0.0870	0.7594	0.6571	0.5457	0.3200	0.0000	0.4983	0.3170	0.1374	0.3335
27.	SAS	0.3865	1.6678	0.4540	0.3605	0.5568	0.4983	0.0000	0.9549	0.4456	0.2932
28.	SDN	0.4382	0.2258	0.7539	0.7317	0.4639	0.3170	0.9549	0.0000	0.3901	0.8176
29.	SHA	0.1329	0.6394	0.5574	0.4782	0.2737	0.1374	0.4456	0.3901	0.0000	0.3088
30.	TSW	0.4930	1.1777	0.6083	0.5380	0.2429	0.3335	0.2932	0.8176	0.3088	0.0000
31.	VEN	0.2507	0.8081	0.9449	0.3246	0.3101	0.2177	0.7334	0.4958	0.2747	0.5850
32.	YOR	0.3159	0.8707	0.8551	0.5069	0.3732	0.2356	0.4482	0.6578	0.0940	0.1755

C-6. Continued.

	TRIBE	31.	32.
1.	AKA	1.4217	0.8031
2.	BAG	0.6246	0.2644
3.	BAK	1.0404	1.0049
4.	BAM	0.2601	0.2681
5.	BAO	0.4712	0.2026
6.	BAS	1.3022	0.5643
7.	BIE	0.1235	0.2921
8.	BUS	1.4914	0.8269
9.	BWA	0.4722	0.1654
10.	CHO	0.3434	0.1200
11.	CUA	0.2683	0.6472
12.	DOB3	0.9079	0.6518
13.	DYO	0.3424	0.1870
14.	FAL1	0.7892	0.4720
15.	FAL2	1.0069	0.3352
16.	FOU	0.5925	0.3573
17.	GIN	0.3241	0.1126
18.	HEH	0.2258	0.1997
19.	KUR	0.5696	0.3121
20.	LES	0.6402	0.2177
21.	LUI	0.2507	0.3159
22.	MAL	0.8081	0.8707
23.	MAN	0.9449	0.8551
24.	MER	0.3246	0.5069
25.	NDB	0.3101	0.3732
26.	PED	0.2177	0.2356
27.	SAS	0.7334	0.4482
28.	SON	0.4958	0.6578
29.	SHA	0.2747	0.0940
30.	TSW	0.5850	0.1755
31.	VEN	0.0000	0.4135
32.	YOR	0.4135	0.0000

C-7. Male Finger Pattern Frequency Distance Matrix.

	TRIBE	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1.	AKA	0.000	1.382	1.770	0.666	0.299	0.844	0.278	0.365	0.425	1.674	0.574
2.	AOY	1.382	0.000	0.167	0.353	0.657	0.308	0.656	0.550	1.958	0.284	0.413
3.	ASY	1.770	0.167	0.000	0.467	0.934	0.417	0.862	0.771	2.367	0.344	0.636
4.	BAB	0.666	0.353	0.467	0.000	0.229	0.152	0.235	0.171	1.107	0.548	0.176
5.	BAG	0.299	0.657	0.934	0.229	0.000	0.286	0.157	0.071	0.736	0.875	0.213
6.	BAK	0.844	0.308	0.417	0.152	0.286	0.000	0.377	0.223	1.456	0.573	0.311
7.	BAM	0.278	0.656	0.862	0.235	0.157	0.377	0.000	0.152	0.759	0.773	0.248
8.	BAO	0.365	0.550	0.771	0.171	0.071	0.223	0.152	0.000	0.776	0.825	0.165
9.	BAS	0.425	1.958	2.367	1.107	0.736	1.456	0.759	0.776	0.000	2.167	0.909
10.	BEO	1.674	0.284	0.344	0.548	0.875	0.573	0.773	0.825	2.167	0.000	0.604
11.	BIE	0.574	0.413	0.636	0.176	0.213	0.311	0.248	0.165	0.909	0.604	0.000
12.	BKO	0.588	0.416	0.545	0.090	0.217	0.121	0.233	0.192	1.202	0.650	0.235
13.	BOZ	0.325	0.637	0.839	0.208	0.131	0.359	0.152	0.120	0.656	0.793	0.163
14.	BUS	0.644	2.415	2.677	1.532	1.024	1.563	1.114	1.001	0.851	3.006	1.463
15.	CHO	0.472	0.448	0.626	0.097	0.179	0.238	0.193	0.142	0.949	0.637	0.145
16.	CUA	0.471	0.607	0.868	0.302	0.169	0.429	0.246	0.164	0.750	0.799	0.091
17.	DOG1	0.545	0.793	1.069	0.498	0.302	0.614	0.382	0.243	0.792	1.049	0.309
18.	DOG2	0.464	0.426	0.659	0.196	0.160	0.303	0.179	0.104	1.000	0.648	0.171
19.	DYO	0.338	0.548	0.750	0.164	0.108	0.220	0.145	0.078	0.710	0.804	0.162
20.	EFE	0.154	1.542	1.875	0.703	0.395	0.910	0.399	0.454	0.436	1.819	0.706
21.	EFE2	0.177	1.678	1.995	0.848	0.518	1.042	0.432	0.545	0.463	2.024	0.829
22.	FAL1	0.825	0.512	0.681	0.217	0.372	0.305	0.311	0.319	1.360	0.609	0.355
23.	FAL2	0.688	0.403	0.602	0.170	0.269	0.211	0.259	0.227	1.148	0.567	0.165
24.	FAL3	0.626	0.646	0.815	0.302	0.329	0.328	0.337	0.286	1.121	0.869	0.404
25.	FOU	0.718	0.442	0.543	0.203	0.231	0.124	0.320	0.218	1.252	0.725	0.295
26.	FUL	0.658	0.600	0.739	0.254	0.334	0.243	0.212	0.245	1.240	0.758	0.410
27.	GIN	0.366	0.507	0.757	0.220	0.110	0.289	0.200	0.113	0.729	0.708	0.138
28.	HEH	0.344	0.668	0.855	0.145	0.112	0.206	0.150	0.101	0.884	0.828	0.233
29.	KIR	0.381	0.519	0.728	0.165	0.087	0.251	0.129	0.053	0.804	0.693	0.141
30.	KUR	0.329	0.601	0.822	0.202	0.070	0.239	0.145	0.055	0.822	0.893	0.230
31.	KUS	0.418	0.694	0.978	0.305	0.194	0.431	0.241	0.155	0.876	0.995	0.352
32.	LES	0.201	1.116	1.419	0.484	0.271	0.664	0.327	0.277	0.499	1.410	0.406
33.	LUI	0.311	0.576	0.839	0.215	0.133	0.364	0.174	0.150	0.730	0.725	0.162
34.	MAN	1.035	0.262	0.393	0.208	0.371	0.240	0.484	0.293	1.468	0.471	0.200
35.	MAN	0.701	0.612	0.872	0.375	0.434	0.512	0.427	0.338	0.987	0.859	0.270
36.	MER	1.251	0.290	0.420	0.415	0.623	0.510	0.668	0.600	1.583	0.348	0.405
37.	NDB	0.483	0.837	1.213	0.536	0.378	0.690	0.353	0.315	0.878	1.194	0.353
38.	PED	0.228	0.791	1.094	0.297	0.116	0.406	0.182	0.139	0.621	0.993	0.211
39.	SAS	0.250	0.848	1.181	0.374	0.164	0.510	0.192	0.126	0.621	1.130	0.291
40.	SON	1.033	0.500	0.514	0.306	0.514	0.479	0.614	0.427	1.431	0.561	0.358
41.	SHA	0.275	0.807	1.087	0.236	0.084	0.374	0.212	0.097	0.628	1.105	0.304
42.	SUK	0.385	0.689	1.055	0.352	0.218	0.407	0.310	0.226	0.700	1.058	0.233
43.	TAN	0.986	0.218	0.389	0.253	0.368	0.275	0.336	0.300	1.411	0.311	0.233
44.	TSW	0.503	0.462	0.625	0.138	0.164	0.294	0.174	0.088	0.862	0.668	0.186
45.	VEN	0.958	0.546	0.682	0.360	0.376	0.378	0.408	0.257	1.293	0.726	0.384
46.	YOR	0.542	0.424	0.586	0.181	0.200	0.214	0.205	0.114	0.916	0.716	0.156

C-7. Continued.

	TRIBE	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.
1.	AKA	0.588	0.325	0.644	0.472	0.471	0.545	0.464	0.338	0.154	0.177	0.825
2.	AOY	0.416	0.637	2.415	0.448	0.607	0.793	0.426	0.548	1.542	1.678	0.512
3.	ASY	0.545	0.839	2.677	0.626	0.868	1.069	0.659	0.750	1.875	1.995	0.681
4.	BAB	0.090	0.208	1.532	0.097	0.302	0.498	0.196	0.164	0.703	0.848	0.217
5.	BAG	0.217	0.131	1.024	0.179	0.169	0.302	0.160	0.108	0.395	0.518	0.372
6.	BAK	0.121	0.359	1.563	0.238	0.429	0.614	0.303	0.220	0.910	1.042	0.305
7.	BAM	0.233	0.152	1.114	0.193	0.246	0.382	0.179	0.145	0.399	0.432	0.311
8.	BAO	0.192	0.120	1.001	0.142	0.164	0.243	0.104	0.078	0.454	0.545	0.319
9.	BAS	1.202	0.656	0.851	0.949	0.750	0.792	1.000	0.710	0.436	0.463	1.360
10.	BEO	0.650	0.793	3.006	0.637	0.799	1.049	0.648	0.804	1.819	2.024	0.609
11.	BIE	0.235	0.163	1.463	0.145	0.091	0.309	0.171	0.162	0.706	0.829	0.355
12.	BKO	0.000	0.209	1.502	0.113	0.352	0.547	0.171	0.129	0.622	0.799	0.198
13.	BOZ	0.209	0.000	1.157	0.138	0.160	0.393	0.180	0.122	0.408	0.515	0.371
14.	BUS	1.502	1.157	0.000	1.366	1.203	1.068	1.385	1.076	0.669	0.541	2.043
15.	CHO	0.113	0.138	1.366	0.000	0.188	0.392	0.141	0.133	0.573	0.734	0.304
16.	CUA	0.352	0.160	1.203	0.188	0.000	0.238	0.215	0.180	0.621	0.699	0.489
17.	DOG1	0.547	0.393	1.068	0.392	0.238	0.000	0.228	0.298	0.709	0.850	0.650
18.	DOG2	0.171	0.180	1.385	0.141	0.215	0.228	0.000	0.129	0.588	0.751	0.265
19.	DYO	0.129	0.122	1.076	0.133	0.180	0.298	0.129	0.000	0.400	0.518	0.279
20.	EFE	0.622	0.408	0.669	0.573	0.621	0.709	0.588	0.400	0.000	0.117	0.942
21.	EFE2	0.799	0.515	0.541	0.734	0.699	0.850	0.751	0.518	0.117	0.000	1.126
22.	FAL1	0.198	0.371	2.043	0.304	0.489	0.650	0.265	0.279	0.942	1.126	0.000
23.	FAL2	0.182	0.208	1.600	0.179	0.196	0.497	0.239	0.185	0.775	0.895	0.249
24.	FAL3	0.175	0.219	1.634	0.294	0.457	0.755	0.297	0.209	0.609	0.748	0.342
25.	FOU	0.120	0.267	1.470	0.234	0.393	0.572	0.276	0.170	0.783	0.933	0.224
26.	FUL	0.236	0.353	1.520	0.376	0.499	0.677	0.318	0.233	0.718	0.754	0.231
27.	GIN	0.243	0.129	1.073	0.133	0.122	0.323	0.177	0.109	0.519	0.581	0.451
28.	HEH	0.099	0.142	1.057	0.106	0.248	0.408	0.185	0.114	0.412	0.545	0.285
29.	KIR	0.171	0.099	1.193	0.080	0.125	0.260	0.098	0.078	0.470	0.592	0.299
30.	KUR	0.212	0.157	0.903	0.194	0.232	0.353	0.165	0.123	0.406	0.460	0.402
31.	KUS	0.271	0.252	1.283	0.343	0.431	0.411	0.146	0.218	0.457	0.610	0.363
32.	LES	0.497	0.264	0.646	0.274	0.293	0.425	0.456	0.292	0.304	0.370	0.828
33.	LUI	0.189	0.110	1.197	0.103	0.175	0.378	0.140	0.115	0.453	0.577	0.379
34.	MAM	0.300	0.406	1.843	0.219	0.251	0.410	0.276	0.317	1.177	1.336	0.366
35.	MAN	0.481	0.440	1.395	0.287	0.295	0.335	0.369	0.338	0.886	1.039	0.526
36.	MER	0.553	0.588	2.252	0.443	0.503	0.778	0.538	0.601	1.490	1.533	0.677
37.	NOB	0.554	0.406	0.934	0.425	0.275	0.376	0.363	0.366	0.548	0.644	0.790
38.	PED	0.238	0.100	1.037	0.153	0.183	0.386	0.229	0.119	0.273	0.412	0.417
39.	SAS	0.313	0.186	0.947	0.268	0.265	0.246	0.151	0.134	0.308	0.444	0.417
40.	SDN	0.353	0.377	2.040	0.230	0.435	0.613	0.305	0.412	1.084	1.358	0.536
41.	SHA	0.262	0.184	0.893	0.244	0.322	0.369	0.220	0.133	0.284	0.392	0.440
42.	SUK	0.386	0.261	0.964	0.269	0.201	0.392	0.337	0.214	0.521	0.580	0.543
43.	TAN	0.315	0.346	1.967	0.281	0.293	0.589	0.309	0.343	1.148	1.209	0.332
44.	TSW	0.224	0.164	1.190	0.113	0.198	0.350	0.159	0.166	0.554	0.645	0.396
45.	VEN	0.519	0.393	1.515	0.453	0.385	0.571	0.427	0.411	1.090	1.100	0.484
46.	YOR	0.214	0.163	1.274	0.199	0.216	0.386	0.180	0.107	0.693	0.763	0.276

C-7. Continued.

	TRIBE	23.	24.	25.	26.	27.	28.	29.	30.	31.	32.	33.
1.	AKA	0.688	0.626	0.718	0.658	0.366	0.344	0.381	0.329	0.418	0.201	0.311
2.	AOY	0.403	0.646	0.442	0.600	0.507	0.668	0.519	0.601	0.694	1.116	0.576
3.	ASY	0.602	0.815	0.543	0.739	0.757	0.855	0.728	0.822	0.978	1.419	0.839
4.	BAB	0.170	0.302	0.203	0.254	0.220	0.145	0.165	0.202	0.305	0.484	0.215
5.	BAG	0.269	0.329	0.231	0.334	0.110	0.112	0.087	0.070	0.194	0.271	0.133
6.	BAK	0.211	0.328	0.124	0.243	0.289	0.206	0.251	0.239	0.431	0.664	0.364
7.	BAM	0.259	0.337	0.320	0.212	0.200	0.150	0.129	0.145	0.241	0.327	0.174
8.	BAO	0.227	0.286	0.218	0.245	0.113	0.101	0.053	0.055	0.155	0.277	0.150
9.	BAS	1.148	1.121	1.252	1.240	0.729	0.884	0.804	0.822	0.876	0.499	0.730
10.	BEO	0.567	0.869	0.725	0.758	0.708	0.828	0.693	0.893	0.995	1.410	0.725
11.	BIE	0.165	0.404	0.295	0.410	0.138	0.233	0.141	0.230	0.352	0.406	0.162
12.	BKO	0.182	0.175	0.120	0.236	0.243	0.099	0.171	0.212	0.271	0.497	0.189
13.	BOZ	0.208	0.219	0.267	0.353	0.129	0.142	0.099	0.157	0.252	0.264	0.110
14.	BUS	1.600	1.634	1.470	1.520	1.073	1.057	1.193	0.903	1.283	0.646	1.197
15.	CHO	0.179	0.294	0.234	0.376	0.133	0.106	0.080	0.194	0.343	0.274	0.103
16.	CUA	0.196	0.457	0.393	0.499	0.122	0.248	0.125	0.232	0.431	0.293	0.175
17.	DOG1	0.497	0.755	0.572	0.677	0.323	0.408	0.260	0.353	0.411	0.425	0.378
18.	DOG2	0.239	0.297	0.276	0.318	0.177	0.185	0.098	0.165	0.146	0.456	0.140
19.	DYO	0.185	0.209	0.170	0.233	0.109	0.114	0.078	0.123	0.218	0.292	0.115
20.	EFE	0.775	0.609	0.783	0.718	0.519	0.412	0.470	0.406	0.457	0.304	0.453
21.	EFE2	0.895	0.748	0.933	0.754	0.581	0.545	0.592	0.460	0.610	0.370	0.577
22.	FAL1	0.249	0.342	0.224	0.231	0.451	0.285	0.299	0.402	0.363	0.828	0.379
23.	FAL2	0.000	0.238	0.229	0.264	0.252	0.214	0.173	0.279	0.404	0.552	0.262
24.	FAL3	0.238	0.000	0.292	0.299	0.395	0.273	0.256	0.330	0.294	0.667	0.300
25.	FOU	0.229	0.292	0.000	0.303	0.274	0.203	0.237	0.217	0.397	0.594	0.308
26.	FUL	0.264	0.299	0.303	0.000	0.384	0.250	0.270	0.271	0.297	0.715	0.404
27.	GIN	0.252	0.395	0.274	0.384	0.000	0.158	0.092	0.123	0.338	0.235	0.071
28.	HEH	0.214	0.273	0.203	0.250	0.158	0.000	0.098	0.112	0.258	0.247	0.123
29.	KIR	0.173	0.256	0.237	0.270	0.092	0.098	0.000	0.111	0.223	0.262	0.100
30.	KUR	0.279	0.330	0.217	0.271	0.123	0.112	0.111	0.000	0.194	0.288	0.174
31.	KUS	0.404	0.294	0.397	0.297	0.338	0.258	0.223	0.194	0.000	0.540	0.268
32.	LES	0.552	0.667	0.594	0.715	0.235	0.247	0.262	0.288	0.540	0.000	0.240
33.	LUI	0.262	0.300	0.308	0.404	0.071	0.123	0.100	0.174	0.268	0.240	0.000
34.	MAN	0.197	0.567	0.293	0.525	0.280	0.360	0.244	0.383	0.586	0.676	0.374
35.	MAN	0.357	0.777	0.488	0.671	0.298	0.383	0.284	0.409	0.597	0.394	0.344
36.	MER	0.514	0.828	0.603	0.814	0.384	0.641	0.486	0.648	0.848	0.912	0.448
37.	NDB	0.512	0.712	0.675	0.683	0.332	0.410	0.347	0.343	0.487	0.367	0.345
38.	PEO	0.270	0.303	0.305	0.402	0.148	0.117	0.106	0.167	0.292	0.154	0.114
39.	SAS	0.392	0.379	0.360	0.409	0.236	0.200	0.172	0.169	0.185	0.269	0.192
40.	SDN	0.425	0.504	0.495	0.758	0.399	0.445	0.326	0.550	0.620	0.723	0.331
41.	SHA	0.414	0.386	0.317	0.369	0.198	0.153	0.166	0.103	0.167	0.264	0.200
42.	SUK	0.285	0.544	0.352	0.538	0.184	0.268	0.253	0.194	0.467	0.267	0.236
43.	TAN	0.198	0.409	0.314	0.355	0.289	0.378	0.255	0.356	0.499	0.747	0.339
44.	TSW	0.263	0.347	0.313	0.361	0.150	0.167	0.091	0.132	0.259	0.314	0.166
45.	VEN	0.324	0.588	0.402	0.388	0.411	0.441	0.330	0.312	0.502	0.722	0.508
46.	YOR	0.184	0.315	0.161	0.246	0.167	0.220	0.155	0.151	0.291	0.444	0.226

C-7. Continued.

	TRIBE	34.	35.	36.	37.	38.	39.	40.	41.	42.	43.	44.
1.	AKA	1.035	0.701	1.251	0.483	0.228	0.250	1.033	0.275	0.385	0.986	0.503
2.	AOY	0.262	0.612	0.290	0.837	0.791	0.848	0.500	0.807	0.689	0.218	0.462
3.	ASY	0.393	0.872	0.420	1.213	1.094	1.181	0.514	1.087	1.055	0.389	0.625
4.	BAB	0.208	0.375	0.415	0.536	0.297	0.374	0.306	0.236	0.352	0.253	0.138
5.	BAG	0.371	0.434	0.623	0.378	0.116	0.164	0.514	0.084	0.218	0.368	0.164
6.	BAK	0.240	0.512	0.510	0.690	0.406	0.510	0.479	0.374	0.407	0.275	0.294
7.	BAM	0.484	0.427	0.668	0.353	0.182	0.192	0.614	0.212	0.310	0.336	0.174
8.	BAO	0.293	0.338	0.600	0.315	0.139	0.126	0.427	0.097	0.226	0.300	0.088
9.	BAS	1.468	0.987	1.583	0.878	0.621	0.621	1.431	0.628	0.700	1.411	0.862
10.	BEO	0.471	0.859	0.348	1.194	0.993	1.130	0.561	1.105	1.058	0.311	0.668
11.	BIE	0.200	0.270	0.405	0.353	0.211	0.291	0.358	0.304	0.233	0.233	0.186
12.	BKO	0.300	0.481	0.553	0.554	0.238	0.313	0.353	0.262	0.386	0.315	0.224
13.	BOZ	0.406	0.440	0.588	0.406	0.100	0.186	0.377	0.184	0.261	0.346	0.164
14.	BUS	1.843	1.395	2.252	0.934	1.037	0.947	2.040	0.893	0.964	1.967	1.190
15.	CHO	0.219	0.287	0.443	0.425	0.153	0.268	0.230	0.244	0.269	0.281	0.113
16.	CUA	0.251	0.295	0.503	0.275	0.183	0.265	0.435	0.322	0.201	0.293	0.198
17.	DOG1	0.410	0.335	0.778	0.376	0.386	0.246	0.613	0.369	0.392	0.589	0.350
18.	DOG2	0.276	0.369	0.538	0.363	0.229	0.151	0.305	0.220	0.337	0.309	0.159
19.	DYO	0.317	0.338	0.601	0.366	0.119	0.134	0.412	0.133	0.214	0.343	0.166
20.	EFE	1.177	0.886	1.490	0.548	0.273	0.308	1.084	0.284	0.521	1.148	0.554
21.	EFE2	1.336	1.039	1.533	0.644	0.412	0.444	1.358	0.392	0.580	1.209	0.645
22.	FAL1	0.366	0.526	0.677	0.790	0.417	0.417	0.536	0.440	0.543	0.332	0.396
23.	FAL2	0.197	0.357	0.514	0.512	0.270	0.392	0.425	0.414	0.285	0.198	0.263
24.	FAL3	0.567	0.777	0.828	0.712	0.303	0.379	0.504	0.386	0.544	0.409	0.347
25.	FOU	0.293	0.488	0.603	0.675	0.305	0.360	0.495	0.317	0.352	0.314	0.313
26.	FUL	0.525	0.671	0.814	0.683	0.402	0.409	0.758	0.369	0.538	0.355	0.361
27.	GIN	0.280	0.298	0.384	0.332	0.148	0.236	0.399	0.198	0.184	0.289	0.150
28.	HEH	0.360	0.383	0.641	0.410	0.117	0.200	0.445	0.153	0.268	0.378	0.167
29.	KIR	0.244	0.284	0.486	0.347	0.106	0.172	0.326	0.166	0.253	0.255	0.091
30.	KUR	0.383	0.409	0.648	0.343	0.167	0.169	0.550	0.103	0.194	0.356	0.132
31.	KUS	0.586	0.597	0.848	0.487	0.292	0.185	0.620	0.167	0.467	0.499	0.259
32.	LES	0.676	0.394	0.912	0.367	0.154	0.269	0.723	0.264	0.267	0.747	0.314
33.	LUI	0.374	0.344	0.448	0.345	0.114	0.192	0.331	0.200	0.236	0.339	0.166
34.	MAM	0.000	0.281	0.323	0.603	0.464	0.546	0.294	0.525	0.405	0.208	0.274
35.	MAN	0.281	0.000	0.527	0.421	0.403	0.435	0.544	0.512	0.297	0.449	0.340
36.	MER	0.323	0.527	0.000	0.890	0.764	0.939	0.457	0.792	0.712	0.282	0.432
37.	NOB	0.603	0.421	0.890	0.000	0.364	0.285	0.799	0.406	0.363	0.600	0.302
38.	PED	0.464	0.403	0.764	0.364	0.000	0.126	0.512	0.162	0.188	0.467	0.221
39.	SAS	0.546	0.435	0.939	0.285	0.126	0.000	0.608	0.137	0.267	0.548	0.259
40.	SON	0.294	0.544	0.457	0.799	0.512	0.608	0.000	0.591	0.638	0.493	0.363
41.	SHA	0.525	0.512	0.792	0.406	0.162	0.137	0.591	0.000	0.276	0.565	0.191
42.	SUK	0.405	0.297	0.712	0.363	0.188	0.267	0.638	0.276	0.000	0.505	0.340
43.	TAN	0.208	0.449	0.282	0.600	0.467	0.548	0.493	0.565	0.505	0.000	0.237
44.	TSW	0.274	0.340	0.432	0.302	0.221	0.259	0.363	0.191	0.340	0.237	0.000
45.	VEN	0.361	0.519	0.636	0.623	0.546	0.521	0.631	0.454	0.440	0.275	0.318
46.	YOR	0.260	0.338	0.547	0.474	0.260	0.255	0.477	0.262	0.258	0.246	0.191

C-7. Continued.

	TRIBE	45.	46.
1.	AKA	0.958	0.542
2.	AOY	0.546	0.424
3.	ASY	0.682	0.586
4.	BAB	0.360	0.181
5.	BAG	0.376	0.200
6.	BAK	0.378	0.214
7.	BAM	0.408	0.205
8.	BAO	0.257	0.114
9.	BAS	1.293	0.916
10.	BEO	0.726	0.716
11.	BIE	0.384	0.156
12.	BKO	0.519	0.214
13.	BOZ	0.393	0.163
14.	BUS	1.515	1.274
15.	CHO	0.453	0.199
16.	CUA	0.385	0.216
17.	DOG1	0.571	0.386
18.	DOG2	0.427	0.180
19.	DYO	0.411	0.107
20.	EFE	1.090	0.693
21.	EFE2	1.100	0.763
22.	FAL1	0.484	0.276
23.	FAL2	0.324	0.184
24.	FAL3	0.588	0.315
25.	FOU	0.402	0.161
26.	FUL	0.388	0.246
27.	GIN	0.411	0.167
28.	HEH	0.441	0.220
29.	KIR	0.330	0.155
30.	KUR	0.312	0.151
31.	KUS	0.502	0.291
32.	LES	0.722	0.444
33.	LUI	0.508	0.226
34.	MAN	0.361	0.260
35.	MAN	0.519	0.338
36.	MER	0.636	0.547
37.	NDB	0.623	0.474
38.	PEO	0.546	0.260
39.	SAS	0.521	0.255
40.	SON	0.631	0.477
41.	SHA	0.454	0.262
42.	SUK	0.440	0.258
43.	TAN	0.275	0.246
44.	TSW	0.318	0.191
45.	VEN	0.000	0.270
46.	YOR	0.270	0.000

C-8. Female Finger Pattern Frequency Distance Matrix.

	TRIBE	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1.	AKA	0.000	0.599	0.497	0.871	0.353	0.285	0.133	0.417	0.733	0.752	0.496
2.	BAB	0.599	0.000	0.172	0.170	0.248	0.261	0.502	0.470	0.164	1.400	0.244
3.	BAG	0.497	0.172	0.000	0.279	0.196	0.162	0.335	0.252	0.294	1.081	0.217
4.	BAK	0.871	0.170	0.279	0.000	0.290	0.431	0.721	0.633	0.142	1.347	0.492
5.	BAM	0.353	0.248	0.196	0.290	0.000	0.181	0.320	0.356	0.364	0.935	0.309
6.	BAO	0.285	0.261	0.162	0.431	0.181	0.000	0.240	0.332	0.422	0.912	0.284
7.	BAS	0.133	0.502	0.335	0.721	0.320	0.240	0.000	0.344	0.586	0.869	0.397
8.	BIE	0.417	0.470	0.252	0.633	0.356	0.332	0.344	0.000	0.493	1.216	0.226
9.	BKO	0.733	0.164	0.294	0.142	0.364	0.422	0.586	0.493	0.000	1.458	0.324
10.	BUS	0.752	1.400	1.081	1.347	0.935	0.912	0.869	1.216	1.458	0.000	1.522
11.	CHO	0.496	0.244	0.217	0.492	0.309	0.284	0.397	0.226	0.324	1.522	0.000
12.	CUA	0.258	0.439	0.279	0.558	0.266	0.147	0.301	0.341	0.569	0.715	0.384
13.	DOG2	0.468	0.117	0.125	0.226	0.142	0.143	0.395	0.451	0.265	0.984	0.305
14.	DYO	0.384	0.232	0.180	0.329	0.104	0.225	0.309	0.346	0.302	1.039	0.278
15.	EFE	0.124	0.504	0.454	0.698	0.325	0.255	0.163	0.517	0.619	0.747	0.533
16.	EFE2	0.406	1.232	0.933	1.524	0.928	0.593	0.460	1.034	1.417	0.687	1.134
17.	FAL1	0.930	0.173	0.299	0.238	0.427	0.479	0.702	0.612	0.185	1.728	0.311
18.	FAL2	0.688	0.345	0.402	0.472	0.317	0.278	0.636	0.552	0.545	1.526	0.406
19.	FOU	0.458	0.416	0.241	0.661	0.322	0.269	0.342	0.194	0.538	1.380	0.166
20.	GIN	0.422	0.176	0.167	0.307	0.217	0.151	0.329	0.255	0.224	1.075	0.172
21.	HEH	0.292	0.395	0.236	0.589	0.274	0.192	0.245	0.147	0.500	1.063	0.207
22.	KIR	0.576	0.296	0.141	0.407	0.290	0.137	0.398	0.311	0.397	1.128	0.248
23.	KUR	0.333	0.194	0.143	0.383	0.178	0.108	0.259	0.329	0.415	0.787	0.293
24.	LES	0.596	0.393	0.320	0.622	0.390	0.325	0.443	0.347	0.531	1.577	0.254
25.	LUI	0.459	0.213	0.145	0.289	0.155	0.200	0.344	0.247	0.271	1.110	0.197
26.	MAM	0.893	0.253	0.222	0.244	0.258	0.355	0.718	0.460	0.310	1.594	0.286
27.	MER	1.248	0.451	0.464	0.417	0.622	0.671	1.034	0.709	0.468	2.338	0.434
28.	NOB	0.493	0.292	0.218	0.348	0.251	0.166	0.361	0.493	0.390	0.879	0.353
29.	PED	0.253	0.311	0.236	0.446	0.157	0.108	0.227	0.324	0.450	0.745	0.342
30.	SAS	0.314	0.320	0.178	0.582	0.263	0.142	0.261	0.293	0.530	1.029	0.234
31.	SDN	1.129	0.511	0.410	0.624	0.623	0.631	0.873	0.492	0.503	2.269	0.258
32.	SHA	0.304	0.325	0.155	0.400	0.144	0.171	0.226	0.232	0.411	0.894	0.252
33.	TSW	0.185	0.495	0.348	0.712	0.326	0.134	0.178	0.467	0.635	0.683	0.436
34.	VEN	0.548	0.438	0.245	0.538	0.303	0.307	0.381	0.173	0.539	1.255	0.283
35.	YOR	0.337	0.314	0.165	0.470	0.185	0.188	0.293	0.299	0.483	0.942	0.223

C-8. Continued.

	TRIBE	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.
1.	AKA	0.258	0.468	0.384	0.124	0.406	0.930	0.688	0.458	0.422	0.292	0.576
2.	BAB	0.439	0.117	0.232	0.504	1.232	0.173	0.345	0.416	0.176	0.395	0.296
3.	BAG	0.279	0.125	0.180	0.454	0.933	0.299	0.402	0.241	0.167	0.236	0.141
4.	BAK	0.558	0.226	0.329	0.698	1.524	0.238	0.472	0.661	0.307	0.589	0.407
5.	BAM	0.266	0.142	0.104	0.325	0.928	0.427	0.317	0.322	0.217	0.274	0.290
6.	BAO	0.147	0.143	0.225	0.255	0.593	0.479	0.278	0.269	0.151	0.192	0.137
7.	BAS	0.301	0.395	0.309	0.163	0.460	0.702	0.636	0.342	0.329	0.245	0.398
8.	BIE	0.341	0.451	0.346	0.517	1.034	0.612	0.552	0.194	0.255	0.147	0.311
9.	BKO	0.569	0.265	0.302	0.619	1.417	0.185	0.545	0.538	0.224	0.500	0.397
10.	BUS	0.715	0.984	1.039	0.747	0.687	1.728	1.526	1.380	1.075	1.063	1.128
11.	CHO	0.384	0.305	0.278	0.533	1.134	0.311	0.406	0.166	0.172	0.207	0.248
12.	CUA	0.000	0.310	0.344	0.274	0.593	0.642	0.436	0.281	0.205	0.128	0.285
13.	DOG2	0.310	0.000	0.149	0.379	0.873	0.280	0.337	0.418	0.185	0.338	0.234
14.	DYO	0.344	0.149	0.000	0.389	0.974	0.406	0.459	0.280	0.219	0.293	0.317
15.	EFE	0.274	0.379	0.389	0.000	0.469	0.750	0.628	0.557	0.438	0.360	0.547
16.	EFE2	0.593	0.873	0.974	0.469	0.000	1.594	1.344	1.037	0.913	0.777	0.938
17.	FAL1	0.642	0.280	0.406	0.750	1.594	0.000	0.406	0.481	0.319	0.519	0.371
18.	FAL2	0.436	0.337	0.459	0.628	1.344	0.406	0.000	0.394	0.269	0.400	0.245
19.	FOU	0.281	0.418	0.280	0.557	1.037	0.481	0.394	0.000	0.191	0.121	0.245
20.	GIN	0.205	0.185	0.219	0.438	0.913	0.319	0.269	0.191	0.000	0.173	0.135
21.	HEH	0.128	0.338	0.293	0.360	0.777	0.519	0.400	0.121	0.173	0.000	0.262
22.	KIR	0.285	0.234	0.317	0.547	0.938	0.371	0.245	0.245	0.135	0.262	0.000
23.	KUR	0.193	0.127	0.205	0.270	0.703	0.392	0.338	0.308	0.168	0.218	0.208
24.	LES	0.386	0.418	0.350	0.650	1.230	0.383	0.280	0.114	0.228	0.207	0.256
25.	LUI	0.270	0.185	0.172	0.451	1.048	0.266	0.251	0.189	0.119	0.170	0.168
26.	MAN	0.486	0.283	0.320	0.772	1.528	0.214	0.336	0.344	0.272	0.379	0.273
27.	MER	0.879	0.487	0.566	1.145	2.002	0.410	0.635	0.634	0.564	0.718	0.585
28.	NOB	0.216	0.174	0.255	0.425	0.813	0.343	0.351	0.364	0.186	0.284	0.161
29.	PEO	0.169	0.186	0.216	0.265	0.596	0.526	0.322	0.325	0.159	0.190	0.209
30.	SAS	0.158	0.226	0.255	0.318	0.697	0.442	0.329	0.190	0.197	0.117	0.188
31.	SON	0.720	0.624	0.576	1.159	1.819	0.423	0.600	0.352	0.413	0.484	0.442
32.	SHA	0.147	0.228	0.207	0.290	0.812	0.449	0.318	0.170	0.154	0.148	0.206
33.	TSW	0.183	0.290	0.385	0.169	0.376	0.680	0.522	0.416	0.303	0.239	0.358
34.	VEN	0.344	0.402	0.386	0.558	1.114	0.501	0.426	0.265	0.303	0.186	0.274
35.	YOR	0.157	0.199	0.257	0.341	0.726	0.446	0.389	0.251	0.200	0.174	0.216

C-8. Continued.

	TRIBE	23.	24.	25.	26.	27.	28.	29.	30.	31.	32.	33.
1.	AKA	0.333	0.596	0.459	0.893	1.248	0.493	0.253	0.314	1.129	0.304	0.185
2.	BAB	0.194	0.393	0.213	0.253	0.451	0.292	0.311	0.320	0.511	0.325	0.495
3.	BAG	0.143	0.320	0.145	0.222	0.464	0.218	0.236	0.178	0.410	0.155	0.348
4.	BAK	0.383	0.622	0.289	0.244	0.417	0.348	0.446	0.582	0.624	0.400	0.712
5.	BAM	0.178	0.390	0.155	0.258	0.622	0.251	0.157	0.263	0.623	0.144	0.326
6.	BAO	0.108	0.325	0.200	0.355	0.671	0.166	0.108	0.142	0.631	0.171	0.134
7.	BAS	0.259	0.443	0.344	0.718	1.034	0.361	0.227	0.261	0.873	0.226	0.178
8.	BIE	0.329	0.347	0.247	0.460	0.709	0.493	0.324	0.293	0.492	0.232	0.467
9.	BKO	0.415	0.531	0.271	0.310	0.468	0.390	0.450	0.530	0.503	0.411	0.635
10.	BUS	0.787	1.577	1.110	1.594	2.338	0.879	0.745	1.029	2.269	0.894	0.683
11.	CHO	0.293	0.254	0.197	0.286	0.434	0.353	0.342	0.234	0.258	0.252	0.436
12.	CUA	0.193	0.386	0.270	0.486	0.879	0.216	0.169	0.158	0.720	0.147	0.183
13.	DOG2	0.127	0.418	0.185	0.283	0.487	0.174	0.186	0.226	0.624	0.228	0.290
14.	DYO	0.205	0.350	0.172	0.320	0.566	0.255	0.216	0.255	0.576	0.207	0.385
15.	EFE	0.270	0.650	0.451	0.772	1.145	0.425	0.265	0.318	1.159	0.290	0.169
16.	EFE2	0.703	1.230	1.048	1.528	2.002	0.813	0.596	0.697	1.819	0.812	0.376
17.	FAL1	0.392	0.383	0.266	0.214	0.410	0.343	0.526	0.442	0.423	0.449	0.680
18.	FAL2	0.338	0.280	0.251	0.336	0.635	0.351	0.322	0.329	0.600	0.318	0.522
19.	FOU	0.308	0.114	0.189	0.344	0.634	0.364	0.325	0.190	0.352	0.170	0.416
20.	GIN	0.168	0.228	0.119	0.272	0.564	0.186	0.159	0.197	0.413	0.154	0.303
21.	HEH	0.218	0.207	0.170	0.379	0.718	0.284	0.190	0.117	0.484	0.148	0.239
22.	KIR	0.208	0.256	0.168	0.273	0.585	0.161	0.209	0.188	0.442	0.206	0.358
23.	KUR	0.000	0.344	0.180	0.352	0.775	0.164	0.093	0.151	0.696	0.166	0.204
24.	LES	0.344	0.000	0.246	0.347	0.598	0.307	0.398	0.226	0.442	0.224	0.457
25.	LUI	0.180	0.246	0.000	0.206	0.528	0.225	0.170	0.196	0.376	0.138	0.377
26.	MAM	0.352	0.347	0.206	0.000	0.353	0.340	0.403	0.383	0.310	0.322	0.656
27.	MER	0.775	0.598	0.528	0.353	0.000	0.614	0.872	0.722	0.387	0.590	1.010
28.	NOB	0.164	0.307	0.225	0.340	0.614	0.000	0.211	0.186	0.671	0.196	0.233
29.	PED	0.093	0.398	0.170	0.403	0.872	0.211	0.000	0.174	0.714	0.185	0.210
30.	SAS	0.151	0.226	0.196	0.383	0.722	0.186	0.174	0.000	0.586	0.169	0.205
31.	SDN	0.696	0.442	0.376	0.310	0.387	0.671	0.714	0.586	0.000	0.569	0.972
32.	SHA	0.166	0.224	0.138	0.322	0.590	0.196	0.185	0.169	0.569	0.000	0.248
33.	TSW	0.204	0.457	0.377	0.656	1.010	0.233	0.210	0.205	0.972	0.248	0.000
34.	VEN	0.273	0.383	0.222	0.296	0.690	0.425	0.255	0.262	0.461	0.259	0.495
35.	YOR	0.184	0.320	0.230	0.334	0.608	0.170	0.215	0.101	0.591	0.121	0.232

C-8. Continued.

	TRIBE	34.	35.
1.	AKA	0.548	0.337
2.	BAB	0.438	0.314
3.	BAG	0.245	0.165
4.	BAK	0.538	0.470
5.	BAN	0.303	0.185
6.	BAO	0.307	0.188
7.	BAS	0.381	0.293
8.	BIE	0.173	0.299
9.	BKO	0.539	0.483
10.	BUS	1.255	0.942
11.	CHO	0.283	0.223
12.	CUA	0.344	0.157
13.	DOG2	0.402	0.199
14.	DYO	0.386	0.257
15.	EFE	0.558	0.341
16.	EFE2	1.114	0.726
17.	FAL1	0.501	0.446
18.	FAL2	0.426	0.389
19.	FOU	0.265	0.251
20.	GIN	0.303	0.200
21.	HEH	0.186	0.174
22.	KIR	0.274	0.216
23.	KUR	0.273	0.184
24.	LES	0.383	0.320
25.	LUI	0.222	0.230
26.	MAN	0.296	0.334
27.	MER	0.690	0.608
28.	NOB	0.425	0.170
29.	PEO	0.255	0.215
30.	SAS	0.262	0.101
31.	SON	0.461	0.591
32.	SHA	0.259	0.121
33.	TSW	0.495	0.232
34.	VEN	0.000	0.258
35.	YOR	0.258	0.000

C-9. Male Palmar Pattern Frequency Distance Matrix.

	TRIBE	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1.	AKA	0.000	1.078	1.421	1.228	1.163	1.287	1.063	0.964	1.045	1.623	0.718
2.	AOY	1.078	0.000	0.678	1.722	1.706	1.650	0.982	1.083	1.471	1.666	0.884
3.	ASY	1.421	0.678	0.000	2.129	1.900	1.669	1.472	1.138	1.236	1.251	1.676
4.	BAG	1.228	1.722	2.129	0.000	0.288	2.369	2.074	1.626	1.443	1.123	1.602
5.	BAK	1.163	1.706	1.900	0.288	0.000	2.108	1.617	1.614	1.300	0.872	1.240
6.	BAM	1.287	1.650	1.669	2.369	2.108	0.000	0.609	2.281	1.663	1.621	1.457
7.	BAO	1.063	0.982	1.472	2.074	1.617	0.609	0.000	1.341	1.428	1.428	0.936
8.	BAS	0.964	1.083	1.138	1.626	1.614	2.281	1.341	0.000	1.086	1.709	1.619
9.	BEO	1.045	1.471	1.236	1.443	1.300	1.663	1.428	1.086	0.000	0.700	1.218
10.	BIE	1.623	1.666	1.251	1.123	0.872	1.621	1.428	1.709	0.700	0.000	1.126
11.	BOZ	0.718	0.884	1.676	1.602	1.240	1.457	0.936	1.619	1.218	1.126	0.000
12.	BUS	1.079	1.233	1.968	1.545	0.958	1.134	0.616	1.714	1.412	1.262	0.450
13.	BWA	1.302	1.443	1.067	1.472	1.449	1.410	1.115	1.316	1.205	0.859	1.465
14.	CHO	0.943	1.785	1.491	1.887	1.621	1.279	0.923	1.113	0.525	0.941	1.234
15.	CUA	0.645	0.939	1.093	1.456	1.073	0.990	0.615	1.551	0.813	0.806	0.530
16.	DOG1	1.714	1.977	1.531	2.456	1.847	1.918	2.185	2.836	0.977	1.117	1.244
17.	DOG3	1.047	1.451	1.955	2.368	1.875	2.722	1.586	0.974	2.152	2.602	1.163
18.	DYO	1.290	1.540	1.898	2.234	1.729	2.039	1.247	1.939	2.460	2.067	1.057
19.	EFE2	1.059	0.977	0.967	1.271	1.180	2.144	1.302	1.363	1.026	0.831	1.163
20.	FAL1	1.566	1.059	1.030	1.963	1.929	1.873	1.157	1.833	1.607	1.499	1.849
21.	FAL2	1.014	0.995	1.321	1.051	0.785	1.589	1.352	1.576	0.889	1.347	1.035
22.	FAL3	1.801	1.471	1.159	2.358	2.127	2.506	1.643	1.715	1.590	2.049	2.540
23.	FOU	0.966	0.866	1.235	1.176	0.823	2.045	1.359	1.116	0.967	1.312	0.775
24.	FUL	1.826	1.309	1.348	2.393	2.261	2.738	1.673	1.737	1.902	2.369	2.512
25.	GIN	1.159	0.951	1.334	1.153	0.902	1.632	1.310	1.568	0.922	1.231	0.904
26.	HEH	1.751	1.339	1.223	2.112	2.007	2.780	1.846	1.785	1.923	2.254	2.527
27.	KUR	1.205	1.157	1.502	1.041	0.769	1.495	1.316	1.826	1.046	1.294	1.103
28.	KUS	2.017	1.506	1.289	2.303	2.318	2.965	2.043	1.841	1.901	2.346	2.881
29.	LES	1.301	1.303	1.751	1.178	0.778	1.890	1.538	1.842	1.156	1.545	1.136
30.	LUI	1.668	1.451	1.326	1.981	1.861	2.654	1.733	1.766	1.945	2.241	2.559
31.	MAM	1.118	0.927	1.150	1.240	0.944	1.227	1.088	1.720	1.011	1.321	1.132
32.	MAN	1.661	1.711	1.503	2.102	1.894	2.541	1.585	1.721	1.833	2.181	2.587
33.	MER	1.055	0.592	0.950	1.386	1.041	1.284	0.908	1.449	0.923	1.262	0.855
34.	NDB	1.616	1.349	1.098	2.213	1.965	2.482	1.659	1.731	1.648	2.074	2.350
35.	PED	0.953	0.677	1.164	1.222	0.841	1.544	0.978	1.305	1.083	1.330	0.714
36.	SAS	1.553	1.394	1.358	2.091	1.830	2.430	1.503	1.774	1.801	2.186	2.301
37.	SON	1.078	0.738	1.196	1.378	1.014	1.446	0.956	1.376	1.053	1.378	0.828
38.	SHA	1.997	1.625	1.394	2.198	2.147	2.977	1.950	1.819	2.041	2.263	2.879
39.	SUK	1.277	0.971	1.320	1.284	0.930	1.556	1.246	1.631	1.019	1.423	1.143
40.	TAN	1.980	1.327	1.221	2.497	2.402	2.985	1.950	1.837	2.000	2.383	2.673
41.	TSW	1.527	1.347	1.805	1.168	0.857	1.709	1.469	1.955	1.260	1.510	1.305
42.	VEN	1.942	1.614	1.307	2.033	1.918	2.934	1.957	1.815	2.047	2.117	2.777
43.	YOR	1.329	0.884	1.355	1.500	1.035	1.420	1.048	1.815	1.205	1.529	1.058

C-9. Continued.

	TRIBE	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.
1.	AKA	1.079	1.302	0.943	0.645	1.714	1.047	1.290	1.059	1.566	1.014	1.801
2.	AOY	1.233	1.443	1.785	0.939	1.977	1.451	1.540	0.977	1.059	0.995	1.471
3.	ASY	1.968	1.067	1.491	1.093	1.531	1.955	1.898	0.967	1.030	1.321	1.159
4.	BAG	1.545	1.472	1.887	1.456	2.456	2.368	2.234	1.271	1.963	1.051	2.358
5.	BAK	0.958	1.449	1.621	1.073	1.847	1.875	1.729	1.180	1.929	0.785	2.127
6.	BAM	1.134	1.410	1.279	0.990	1.918	2.722	2.039	2.144	1.873	1.589	2.506
7.	BAO	0.616	1.115	0.923	0.615	2.185	1.586	1.247	1.302	1.157	1.352	1.643
8.	BAS	1.714	1.316	1.113	1.551	2.836	0.974	1.939	1.363	1.833	1.576	1.715
9.	BEO	1.412	1.205	0.525	0.813	0.977	2.152	2.460	1.026	1.607	0.889	1.590
10.	BIE	1.262	0.859	0.941	0.806	1.117	2.602	2.067	0.831	1.499	1.347	2.049
11.	BOZ	0.450	1.465	1.234	0.530	1.244	1.163	1.057	1.163	1.849	1.035	2.540
12.	BUS	0.000	1.415	1.106	0.604	1.455	1.198	0.879	1.653	1.890	0.728	2.292
13.	BWA	1.415	0.000	0.668	0.858	2.105	1.611	0.928	1.003	0.875	1.240	1.624
14.	CHO	1.106	0.668	0.000	0.542	1.370	1.682	1.441	1.066	1.196	1.277	1.349
15.	CUA	0.604	0.858	0.542	0.000	0.774	1.621	0.963	0.489	0.647	0.782	1.006
16.	DOG1	1.455	2.105	1.370	0.774	0.000	2.980	2.436	1.543	2.065	1.161	2.074
17.	DOG3	1.198	1.611	1.682	1.621	2.980	0.000	0.684	2.142	2.542	1.437	2.747
18.	DYO	0.879	0.928	1.441	0.963	2.436	0.684	0.000	1.656	1.545	1.370	2.235
19.	EFE2	1.653	1.003	1.066	0.489	1.543	2.142	1.656	0.000	0.414	1.421	0.756
20.	FAL1	1.890	0.875	1.196	0.647	2.065	2.542	1.545	0.414	0.000	1.538	0.382
21.	FAL2	0.728	1.240	1.277	0.782	1.161	1.437	1.370	1.421	1.538	0.000	1.629
22.	FAL3	2.292	1.624	1.349	1.006	2.074	2.747	2.235	0.756	0.382	1.629	0.000
23.	FOU	0.656	1.097	1.201	0.845	1.391	0.721	0.928	1.300	1.635	0.201	1.774
24.	FUL	2.326	1.817	1.619	1.113	2.444	2.668	2.182	0.788	0.378	1.748	0.067
25.	GIN	0.680	1.031	1.264	0.844	1.295	1.292	1.198	1.478	1.602	0.070	1.922
26.	HEH	2.360	1.632	1.680	1.107	2.354	2.579	2.008	0.729	0.354	1.577	0.093
27.	KUR	0.660	1.140	1.314	0.811	1.272	1.605	1.296	1.540	1.552	0.040	1.784
28.	KUS	2.732	1.655	1.710	1.323	2.582	2.939	2.387	0.824	0.366	1.784	0.093
29.	LES	0.657	1.524	1.532	1.018	1.364	1.447	1.416	1.799	1.974	0.057	2.037
30.	LUI	2.300	1.547	1.622	1.093	2.492	2.537	1.937	0.748	0.359	1.567	0.120
31.	MAN	0.732	1.038	1.235	0.684	1.210	1.614	1.266	1.380	1.242	0.071	1.450
32.	MAN	2.199	1.452	1.322	1.033	2.499	2.498	1.882	0.810	0.399	1.652	0.116
33.	MER	0.622	1.065	1.198	0.604	1.160	1.337	1.171	1.211	1.167	0.120	1.389
34.	NOB	2.146	1.578	1.404	0.912	1.945	2.487	1.951	0.720	0.375	1.438	0.033
35.	PEO	0.498	1.049	1.274	0.710	1.430	0.891	0.876	1.299	1.425	0.138	1.704
36.	SAS	1.981	1.622	1.445	0.892	2.178	2.402	1.818	0.763	0.387	1.430	0.087
37.	SON	0.519	1.014	1.203	0.746	1.431	1.015	0.948	1.435	1.425	0.130	1.699
38.	SHA	2.700	1.702	1.742	1.311	2.743	2.967	2.367	0.726	0.375	1.997	0.110
39.	SUK	0.673	1.298	1.369	0.879	1.286	1.490	1.399	1.598	1.582	0.042	1.656
40.	TAN	2.657	1.952	1.850	1.254	2.461	2.921	2.443	0.736	0.412	1.953	0.098
41.	TSW	0.684	1.401	1.586	1.134	1.585	1.694	1.506	1.959	1.964	0.110	2.158
42.	VEN	2.563	1.635	1.750	1.250	2.589	2.847	2.203	0.691	0.405	1.886	0.142
43.	YOR	0.567	1.441	1.489	0.799	1.297	1.553	1.345	1.600	1.514	0.125	1.636

C-9. Continued.

	TRIBE	23.	24.	25.	26.	27.	28.	29.	30.	31.	32.	33.
1.	AKA	0.966	1.826	1.159	1.751	1.205	2.017	1.301	1.668	1.118	1.661	1.055
2.	AOY	0.866	1.309	0.951	1.339	1.157	1.506	1.303	1.451	0.927	1.711	0.592
3.	ASY	1.235	1.348	1.334	1.223	1.502	1.289	1.751	1.326	1.150	1.503	0.950
4.	BAG	1.176	2.393	1.153	2.112	1.041	2.303	1.178	1.981	1.240	2.102	1.386
5.	BAK	0.823	2.261	0.902	2.007	0.769	2.318	0.778	1.861	0.944	1.894	1.041
6.	BAM	2.045	2.738	1.632	2.780	1.495	2.965	1.890	2.654	1.227	2.541	1.284
7.	BAO	1.359	1.673	1.310	1.846	1.316	2.043	1.538	1.733	1.088	1.585	0.908
8.	BAS	1.116	1.737	1.568	1.785	1.826	1.841	1.842	1.766	1.720	1.721	1.449
9.	BEO	0.967	1.902	0.922	1.923	1.046	1.901	1.156	1.945	1.011	1.833	0.923
10.	BIE	1.312	2.369	1.231	2.254	1.294	2.346	1.545	2.241	1.321	2.181	1.262
11.	BOZ	0.775	2.512	0.904	2.527	1.103	2.881	1.136	2.559	1.132	2.587	0.855
12.	BUS	0.656	2.326	0.680	2.360	0.660	2.732	0.657	2.300	0.732	2.199	0.622
13.	BWA	1.097	1.817	1.031	1.632	1.140	1.655	1.524	1.547	1.038	1.452	1.065
14.	CHO	1.201	1.619	1.264	1.680	1.314	1.710	1.532	1.622	1.235	1.322	1.198
15.	CUA	0.845	1.113	0.844	1.107	0.811	1.323	1.018	1.093	0.684	1.033	0.604
16.	DOG1	1.391	2.444	1.295	2.354	1.272	2.582	1.364	2.492	1.210	2.499	1.160
17.	DOG3	0.721	2.668	1.292	2.579	1.605	2.939	1.447	2.537	1.614	2.498	1.337
18.	DYO	0.928	2.182	1.198	2.008	1.296	2.387	1.416	1.937	1.266	1.882	1.171
19.	EFE2	1.300	0.788	1.478	0.729	1.540	0.824	1.799	0.748	1.380	0.810	1.211
20.	FAL1	1.635	0.378	1.602	0.354	1.552	0.366	1.974	0.359	1.242	0.399	1.167
21.	FAL2	0.201	1.748	0.070	1.577	0.040	1.784	0.057	1.567	0.071	1.652	0.120
22.	FAL3	1.774	0.067	1.922	0.093	1.784	0.093	2.037	0.120	1.450	0.116	1.389
23.	FOU	0.000	1.829	0.144	1.674	0.286	1.916	0.213	1.697	0.359	1.765	0.251
24.	FUL	1.829	0.000	2.031	0.058	1.916	0.083	2.155	0.100	1.586	0.149	1.468
25.	GIN	0.144	2.031	0.000	1.862	0.069	2.050	0.106	1.866	0.125	1.944	0.118
26.	HEH	1.674	0.058	1.862	0.000	1.727	0.048	1.976	0.026	1.427	0.117	1.383
27.	KUR	0.286	1.916	0.069	1.727	0.000	1.937	0.063	1.690	0.056	1.750	0.154
28.	KUS	1.916	0.083	2.050	0.048	1.937	0.000	2.240	0.086	1.611	0.162	1.571
29.	LES	0.213	2.155	0.106	1.976	0.063	2.240	0.000	1.949	0.173	2.009	0.228
30.	LUI	1.697	0.100	1.866	0.026	1.690	0.086	1.949	0.000	1.400	0.056	1.405
31.	MAM	0.359	1.586	0.125	1.427	0.056	1.611	0.173	1.400	0.000	1.474	0.070
32.	MAN	1.765	0.149	1.944	0.117	1.750	0.162	2.009	0.056	1.474	0.000	1.500
33.	MER	0.251	1.468	0.118	1.383	0.154	1.571	0.228	1.405	0.070	1.500	0.000
34.	NOB	1.567	0.074	1.737	0.045	1.597	0.102	1.824	0.073	1.284	0.111	1.240
35.	PEO	0.093	1.741	0.088	1.614	0.170	1.868	0.168	1.606	0.169	1.691	0.082
36.	SAS	1.573	0.077	1.742	0.062	1.555	0.159	1.769	0.045	1.271	0.059	1.249
37.	SON	0.140	1.758	0.066	1.656	0.140	1.871	0.166	1.654	0.126	1.712	0.056
38.	SHA	2.081	0.093	2.287	0.063	2.136	0.058	2.437	0.060	1.818	0.108	1.775
39.	SUK	0.237	1.774	0.081	1.644	0.054	1.844	0.066	1.643	0.062	1.717	0.079
40.	TAN	2.013	0.041	2.243	0.070	2.156	0.081	2.415	0.145	1.794	0.253	1.647
41.	TSW	0.343	2.283	0.114	2.108	0.047	2.329	0.056	2.064	0.151	2.117	0.244
42.	VEN	1.954	0.146	2.181	0.067	2.012	0.106	2.292	0.058	1.721	0.120	1.701
43.	YOR	0.342	1.718	0.171	1.633	0.124	1.876	0.141	1.631	0.085	1.712	0.063

C-9. Continued.

	TRIBE	34.	35.	36.	37.	38.	39.	40.	41.	42.	43.
1.	AKA	1.616	0.953	1.553	1.078	1.997	1.277	1.980	1.527	1.942	1.329
2.	AOY	1.349	0.677	1.394	0.738	1.625	0.971	1.327	1.347	1.614	0.884
3.	ASY	1.098	1.164	1.358	1.196	1.394	1.320	1.221	1.805	1.307	1.355
4.	BAG	2.213	1.222	2.091	1.378	2.198	1.284	2.497	1.168	2.033	1.500
5.	BAK	1.965	0.841	1.830	1.014	2.147	0.930	2.402	0.857	1.918	1.035
6.	BAN	2.482	1.544	2.430	1.446	2.977	1.556	2.985	1.709	2.934	1.420
7.	BAO	1.659	0.978	1.503	0.956	1.950	1.246	1.950	1.469	1.957	1.048
8.	BAS	1.731	1.305	1.774	1.376	1.819	1.631	1.837	1.955	1.815	1.815
9.	BEO	1.648	1.083	1.801	1.053	2.041	1.019	2.000	1.260	2.047	1.205
10.	BIE	2.074	1.330	2.186	1.378	2.263	1.423	2.383	1.510	2.117	1.529
11.	BOZ	2.350	0.714	2.301	0.828	2.879	1.143	2.673	1.305	2.777	1.058
12.	BUS	2.146	0.498	1.981	0.519	2.700	0.673	2.657	0.684	2.563	0.567
13.	BWA	1.578	1.049	1.622	1.014	1.702	1.298	1.952	1.401	1.635	1.441
14.	CHO	1.404	1.274	1.445	1.203	1.742	1.369	1.850	1.586	1.750	1.489
15.	CUA	0.912	0.710	0.892	0.746	1.311	0.879	1.254	1.134	1.250	0.799
16.	DOG1	1.945	1.430	2.178	1.431	2.743	1.286	2.461	1.585	2.589	1.297
17.	DOG3	2.487	0.891	2.402	1.015	2.967	1.490	2.921	1.694	2.847	1.553
18.	DYO	1.951	0.876	1.818	0.948	2.367	1.399	2.443	1.506	2.203	1.345
19.	EFE2	0.720	1.299	0.763	1.435	0.726	1.598	0.736	1.959	0.691	1.600
20.	FAL1	0.375	1.425	0.387	1.425	0.375	1.582	0.412	1.964	0.405	1.514
21.	FAL2	1.438	0.138	1.430	0.130	1.997	0.042	1.953	0.110	1.886	0.125
22.	FAL3	0.033	1.704	0.087	1.699	0.110	1.656	0.098	2.158	0.142	1.636
23.	FOU	1.567	0.093	1.573	0.140	2.081	0.237	2.013	0.343	1.954	0.342
24.	FUL	0.074	1.741	0.077	1.758	0.093	1.774	0.041	2.283	0.146	1.718
25.	GIN	1.737	0.088	1.742	0.066	2.287	0.081	2.243	0.114	2.181	0.171
26.	HEN	0.045	1.614	0.062	1.656	0.063	1.644	0.070	2.108	0.067	1.633
27.	KUR	1.597	0.170	1.555	0.140	2.136	0.054	2.156	0.047	2.012	0.124
28.	KUS	0.102	1.868	0.159	1.871	0.058	1.844	0.081	2.329	0.106	1.876
29.	LES	1.824	0.168	1.769	0.166	2.437	0.066	2.415	0.056	2.292	0.141
30.	LUI	0.073	1.606	0.045	1.654	0.060	1.643	0.145	2.064	0.058	1.631
31.	MAN	1.284	0.169	1.271	0.126	1.818	0.062	1.794	0.151	1.721	0.085
32.	MAN	0.111	1.691	0.059	1.712	0.108	1.717	0.253	2.117	0.120	1.712
33.	MER	1.240	0.082	1.249	0.056	1.775	0.079	1.647	0.244	1.701	0.063
34.	NOB	0.000	1.505	0.043	1.526	0.130	1.493	0.104	1.977	0.130	1.469
35.	PEO	1.505	0.000	1.464	0.024	2.023	0.123	1.949	0.224	1.912	0.134
36.	SAS	0.043	1.464	0.000	1.497	0.138	1.480	0.164	1.910	0.139	1.423
37.	SON	1.526	0.024	1.497	0.000	2.071	0.083	1.993	0.178	1.982	0.100
38.	SHA	0.130	2.023	0.138	2.071	0.000	2.066	0.087	2.539	0.022	2.067
39.	SUK	1.493	0.123	1.480	0.083	2.066	0.000	2.001	0.068	1.960	0.045
40.	TAN	0.104	1.949	0.164	1.993	0.087	2.001	0.000	2.567	0.128	1.955
41.	TSW	1.977	0.224	1.910	0.178	2.539	0.068	2.567	0.000	2.403	0.145
42.	VEN	0.130	1.912	0.139	1.982	0.022	1.960	0.128	2.403	0.000	1.965
43.	YOR	1.469	0.134	1.423	0.100	2.067	0.045	1.955	0.145	1.965	0.000

C-10. Female Palmar Pattern Frequency Distance Matrix.

	TRIBE	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1.	AKA	0.000	1.464	1.596	1.413	1.074	0.882	1.043	0.934	1.181	1.811	1.122
2.	BAG	1.464	0.000	0.387	2.317	1.277	1.496	1.142	1.157	1.525	1.419	1.188
3.	BAK	1.596	0.387	0.000	2.124	1.451	1.562	1.361	1.291	1.076	0.835	1.439
4.	BAM	1.413	2.317	2.124	0.000	0.895	2.135	1.994	2.108	1.344	1.189	1.861
5.	BAO	1.074	1.277	1.451	0.895	0.000	1.181	1.123	1.275	1.282	1.166	0.945
6.	BAS	0.882	1.496	1.562	2.135	1.181	0.000	0.469	1.661	1.552	1.692	1.228
7.	BIE	1.043	1.142	1.361	1.994	1.123	0.469	0.000	1.163	1.114	1.300	1.449
8.	BUS	0.934	1.157	1.291	2.108	1.275	1.661	1.163	0.000	0.760	1.679	1.673
9.	BWA	1.181	1.525	1.076	1.344	1.282	1.552	1.114	0.760	0.000	0.829	1.559
10.	CHO	1.811	1.419	0.835	1.189	1.166	1.692	1.300	1.679	0.829	0.000	1.075
11.	CUA	1.122	1.188	1.439	1.861	0.945	1.228	1.449	1.673	1.559	1.075	0.000
12.	DOG3	1.192	1.587	2.039	1.804	0.739	0.893	0.649	1.537	1.697	1.383	0.703
13.	DYO	1.601	1.923	1.475	1.174	1.780	1.785	1.104	2.294	1.331	0.827	2.004
14.	FAL1	1.129	1.868	1.374	2.365	2.011	1.559	0.983	0.858	0.580	1.418	2.129
15.	FAL2	0.935	1.092	0.990	1.269	0.399	1.025	1.089	1.400	0.957	0.898	0.568
16.	FOU	1.502	1.792	1.352	2.226	1.425	1.744	2.052	1.965	1.260	1.192	0.632
17.	GIN	1.107	1.312	1.520	1.700	0.957	1.697	0.870	0.791	1.046	1.559	1.551
18.	HEH	1.187	1.411	1.804	2.243	1.559	2.205	1.519	1.685	2.110	1.807	1.125
19.	KUR	1.174	1.110	1.034	1.462	1.244	1.727	1.283	1.846	1.134	0.954	1.231
20.	LES	1.799	1.162	1.099	2.228	1.904	1.986	1.413	2.277	1.562	1.634	2.163
21.	LUI	1.657	1.595	1.802	1.304	0.802	1.565	1.485	2.017	1.497	1.638	1.160
22.	MAL	1.877	1.625	1.724	2.228	1.830	2.369	1.670	2.014	1.698	2.329	2.822
23.	MAM	1.490	1.113	1.275	1.512	0.924	1.383	1.371	1.721	1.175	1.361	0.796
24.	MER	2.145	1.836	1.793	2.491	2.053	2.794	2.120	2.272	1.927	2.373	3.015
25.	NDB	1.497	1.069	1.280	1.481	0.781	1.293	1.175	1.726	1.294	1.400	0.944
26.	PED	1.876	1.606	1.804	2.240	1.788	2.436	1.756	2.107	1.837	2.433	2.732
27.	SAS	1.268	1.212	1.234	1.299	0.966	1.167	1.260	1.708	1.030	1.442	1.092
28.	SON	1.732	1.749	1.696	2.045	1.796	2.575	2.006	2.148	1.818	2.270	2.742
29.	SHA	1.450	1.023	1.169	1.442	0.795	1.301	1.187	1.651	1.138	1.327	0.936
30.	TSW	2.037	1.646	1.683	2.294	1.930	2.724	2.063	2.230	1.946	2.373	2.957
31.	VEN	1.334	1.347	1.403	1.089	0.803	1.317	1.316	1.840	1.153	1.399	1.095
32.	YOR	2.019	1.613	1.539	2.079	1.880	2.664	2.017	2.238	1.728	2.216	2.877

C-10. Continued.

	TRIBE	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.
1.	AKA	1.192	1.601	1.129	0.935	1.502	1.107	1.187	1.174	1.799	1.657	1.877
2.	BAG	1.587	1.923	1.868	1.092	1.792	1.312	1.411	1.110	1.162	1.595	1.625
3.	BAK	2.039	1.475	1.374	0.990	1.352	1.520	1.804	1.034	1.099	1.802	1.724
4.	BAM	1.804	1.174	2.365	1.269	2.226	1.700	2.243	1.462	2.228	1.304	2.228
5.	BAO	0.739	1.780	2.011	0.399	1.425	0.957	1.559	1.244	1.904	0.802	1.830
6.	BAS	0.893	1.785	1.559	1.025	1.744	1.697	2.205	1.727	1.986	1.565	2.369
7.	BIE	0.649	1.104	0.983	1.089	2.052	0.870	1.519	1.283	1.413	1.485	1.670
8.	BUS	1.537	2.294	0.858	1.400	1.965	0.791	1.685	1.846	2.277	2.017	2.014
9.	BWA	1.697	1.331	0.580	0.957	1.260	1.046	2.110	1.134	1.562	1.497	1.698
10.	CHO	1.383	0.827	1.418	0.898	1.192	1.559	1.807	0.954	1.634	1.638	2.329
11.	CUA	0.703	2.004	2.129	0.568	0.632	1.551	1.125	1.231	2.163	1.160	2.822
12.	DOG3	0.000	1.508	1.672	0.693	1.362	0.874	0.942	1.518	2.012	0.923	2.124
13.	DYO	1.508	0.000	1.262	1.379	1.983	1.237	1.324	1.077	1.245	1.554	1.766
14.	FAL1	1.672	1.262	0.000	1.314	1.527	1.091	1.754	1.298	1.330	2.284	1.340
15.	FAL2	0.693	1.379	1.314	0.000	0.417	1.006	1.178	0.672	1.086	0.688	1.295
16.	FOU	1.362	1.983	1.527	0.417	0.000	1.716	1.532	1.279	1.821	1.239	2.319
17.	GIN	0.874	1.237	1.091	1.006	1.716	0.000	0.668	1.677	1.926	0.834	1.758
18.	HEH	0.942	1.324	1.754	1.178	1.532	0.668	0.000	1.424	1.881	1.403	2.161
19.	KUR	1.518	1.077	1.298	0.672	1.279	1.677	1.424	0.000	0.363	1.913	0.852
20.	LES	2.012	1.245	1.330	1.086	1.821	1.926	1.881	0.363	0.000	2.134	0.323
21.	LUI	0.923	1.554	2.284	0.688	1.239	0.834	1.403	1.913	2.134	0.000	2.189
22.	MAL	2.124	1.766	1.340	1.295	2.319	1.758	2.161	0.852	0.323	2.189	0.000
23.	MAN	0.978	1.567	1.953	0.546	0.830	0.923	1.332	1.558	1.771	0.133	2.047
24.	MER	2.573	2.133	1.556	1.455	2.435	2.313	2.541	0.761	0.364	2.863	0.119
25.	NDB	0.860	1.433	1.986	0.562	1.068	0.737	1.230	1.600	1.744	0.073	1.958
26.	PED	2.072	1.848	1.508	1.254	2.282	1.754	2.044	0.848	0.342	2.098	0.016
27.	SAS	1.150	1.355	1.708	0.574	0.959	0.963	1.542	1.488	1.557	0.185	1.752
28.	SON	2.296	1.733	1.445	1.215	2.134	1.889	2.022	0.722	0.364	2.318	0.097
29.	SHA	0.937	1.405	1.846	0.507	0.960	0.754	1.274	1.476	1.606	0.101	1.828
30.	TSW	2.529	2.017	1.659	1.424	2.486	2.170	2.391	0.756	0.333	2.638	0.088
31.	VEN	1.053	1.260	1.915	0.561	1.062	0.861	1.412	1.514	1.694	0.073	1.857
32.	YOR	2.460	1.702	1.538	1.283	2.217	1.903	2.223	0.794	0.292	2.170	0.075

C-10. Continued.

	TRIBE	23.	24.	25.	26.	27.	28.	29.	30.	31.	32.
1.	AKA	1.490	2.145	1.497	1.876	1.268	1.732	1.450	2.037	1.334	2.019
2.	BAG	1.113	1.836	1.069	1.606	1.212	1.749	1.023	1.646	1.347	1.613
3.	BAK	1.275	1.793	1.280	1.804	1.234	1.696	1.169	1.683	1.403	1.539
4.	BAM	1.512	2.491	1.481	2.240	1.299	2.045	1.442	2.294	1.089	2.079
5.	BAO	0.924	2.053	0.781	1.788	0.966	1.796	0.795	1.930	0.803	1.880
6.	BAS	1.383	2.794	1.293	2.436	1.167	2.575	1.301	2.724	1.317	2.664
7.	BIE	1.371	2.120	1.175	1.756	1.260	2.006	1.187	2.063	1.316	2.017
8.	BUS	1.721	2.272	1.726	2.107	1.708	2.148	1.651	2.230	1.840	2.238
9.	BWA	1.175	1.927	1.294	1.837	1.030	1.818	1.138	1.946	1.153	1.728
10.	CHO	1.361	2.373	1.400	2.433	1.442	2.270	1.327	2.373	1.399	2.216
11.	CUA	0.796	3.015	0.944	2.732	1.092	2.742	0.936	2.957	1.095	2.877
12.	DOG3	0.978	2.573	0.860	2.072	1.150	2.296	0.937	2.529	1.053	2.460
13.	DYO	1.567	2.133	1.433	1.848	1.355	1.733	1.405	2.017	1.260	1.702
14.	FAL1	1.953	1.556	1.986	1.508	1.708	1.445	1.846	1.659	1.915	1.538
15.	FAL2	0.546	1.455	0.562	1.254	0.574	1.215	0.507	1.424	0.561	1.283
16.	FOU	0.830	2.435	1.068	2.282	0.959	2.134	0.960	2.486	1.062	2.217
17.	GIN	0.923	2.313	0.737	1.754	0.963	1.889	0.754	2.170	0.861	1.903
18.	HEH	1.332	2.541	1.230	2.044	1.542	2.022	1.274	2.391	1.412	2.223
19.	KUR	1.558	0.761	1.600	0.848	1.488	0.722	1.476	0.756	1.514	0.794
20.	LES	1.771	0.364	1.744	0.342	1.557	0.364	1.606	0.333	1.694	0.292
21.	LUI	0.133	2.863	0.073	2.098	0.185	2.318	0.101	2.638	0.073	2.170
22.	MAL	2.047	0.119	1.958	0.016	1.752	0.097	1.828	0.088	1.857	0.075
23.	MAM	0.000	2.617	0.052	1.972	0.090	2.183	0.032	2.432	0.099	2.005
24.	MER	2.617	0.000	2.569	0.145	2.341	0.097	2.402	0.029	2.456	0.136
25.	NDB	0.052	2.569	0.000	1.884	0.123	2.117	0.011	2.357	0.080	1.941
26.	PED	1.972	0.145	1.884	0.000	1.713	0.093	1.764	0.097	1.797	0.083
27.	SAS	0.090	2.341	0.123	1.713	0.000	1.878	0.083	2.145	0.046	1.701
28.	SON	2.183	0.097	2.117	0.093	1.878	0.000	1.976	0.062	1.944	0.063
29.	SHA	0.032	2.402	0.011	1.764	0.083	1.976	0.000	2.206	0.066	1.790
30.	TSW	2.432	0.029	2.357	0.097	2.145	0.062	2.206	0.000	2.239	0.074
31.	VEN	0.099	2.456	0.080	1.797	0.046	1.944	0.066	2.239	0.000	1.787
32.	YOR	2.005	0.136	1.941	0.083	1.701	0.063	1.790	0.074	1.787	0.000

C-11. Male Finger Sample Set Geographic Distance Matrix.

	TRIBE	1.	2.	3.	4.	5.	6.	7.	8.	9.
1.	AKA	0.00	3572.32	3631.89	1115.69	4720.82	1226.20	2023.83	3683.95	0.00
2.	AOY	3572.32	0.00	100.74	4335.11	7568.02	4410.78	5120.95	6496.37	3572.32
3.	ASY	3631.89	100.74	0.00	4410.78	7660.78	4487.76	5203.28	6587.93	3631.89
4.	BAB	1115.69	4335.11	4410.78	0.00	3614.78	110.92	914.19	2569.22	1115.69
5.	BAG	4720.82	7568.02	7660.78	3614.78	0.00	3507.17	2700.63	1085.32	4720.82
6.	BAK	1226.20	4410.78	4487.76	110.92	3507.17	0.00	807.12	2459.45	1226.20
7.	BAM	2023.83	5120.95	5203.28	914.19	2700.63	807.12	0.00	1662.80	2023.83
8.	BAO	3683.95	6496.37	6587.93	2569.22	1085.32	2459.45	1662.80	0.00	3683.95
9.	BAS	0.00	3572.32	3631.89	1115.69	4720.82	1226.20	2023.83	3683.95	0.00
10.	BEO	3286.88	456.11	444.50	4132.39	7494.98	4216.06	4960.57	6413.09	3286.88
11.	BIE	1973.67	3369.17	3464.05	1670.48	4206.17	1666.82	2041.29	3148.15	1973.67
12.	BKO	1890.49	4889.96	4973.46	776.79	2865.68	665.82	248.36	1803.30	1890.49
13.	BOZ	3860.79	7020.68	7106.09	2803.65	1074.24	2705.38	1922.58	888.98	3860.79
14.	BUS	2491.81	2755.53	2855.15	2454.42	4925.06	2466.56	2882.72	3899.72	2491.81
15.	CHO	1509.63	3274.03	3363.16	1351.73	4312.61	1374.24	1909.79	3232.02	1509.63
16.	CUA	2487.64	3228.65	3327.91	2233.23	4456.82	2225.13	2531.89	3442.67	2487.64
17.	DOG1	3591.85	6839.45	6922.03	2564.40	1414.92	2471.53	1718.81	1052.33	3591.85
18.	DOG2	3692.42	6922.03	7005.29	2658.54	1315.89	2564.40	1803.55	1023.64	3692.42
19.	DYO	4989.43	7930.28	8021.91	3896.95	398.18	3791.85	2985.86	1434.01	4989.43
20.	EFE	111.05	3515.03	3572.32	1226.20	4829.21	1336.80	2133.29	3793.97	111.05
21.	EFE2	157.05	3725.40	3785.75	998.72	4588.81	1109.69	1897.39	3559.84	157.05
22.	FAL1	1879.74	5281.95	5355.76	953.63	2953.84	894.34	646.43	2029.40	1879.74
23.	FAL2	1879.74	5281.95	5355.76	953.63	2953.84	894.34	646.43	2029.40	1879.74
24.	FAL3	1879.74	5281.95	5355.76	953.63	2953.84	894.34	646.43	2029.40	1879.74
25.	FOU	1831.43	5199.77	5274.68	865.78	2960.40	799.84	554.08	2010.52	1831.43
26.	FUL	3591.85	6839.45	6922.03	2564.40	1414.92	2471.53	1718.81	1052.33	3591.85
27.	GIN	1805.56	3635.73	3728.09	1351.73	3932.84	1338.05	1691.73	2861.58	1805.56
28.	HEH	1421.58	2166.32	2220.13	2339.82	5882.37	2435.02	3223.68	4802.69	1421.58
29.	KIR	1839.59	5293.39	5364.91	992.26	3060.22	948.46	798.80	2159.88	1839.59
30.	KUR	3655.61	6851.79	6935.91	2608.01	1275.24	2511.65	1739.36	915.48	3655.61
31.	KUS	3322.88	6404.33	6490.54	2235.91	1422.54	2132.83	1332.78	625.49	3322.88
32.	LES	111.05	3515.03	3572.32	1226.20	4829.21	1336.80	2133.29	3793.97	111.05
33.	LUI	1888.17	3425.13	3518.97	1559.62	4144.50	1555.70	1939.20	3080.45	1888.17
34.	MAN	2311.10	5509.13	5590.24	1237.47	2424.27	1139.75	399.86	1450.81	2311.10
35.	MAN	1115.69	4335.11	4410.78	0.00	3614.78	110.92	914.19	2569.22	1115.69
36.	MER	3122.88	674.64	666.75	4002.73	7416.22	4083.76	4847.59	6331.89	3122.88
37.	NOB	3111.38	1807.33	1907.20	3397.27	6048.54	3432.84	3953.23	5029.77	3111.38
38.	PEO	3111.38	1807.33	1907.20	3397.27	6048.54	3432.84	3953.23	5029.77	3111.38
39.	SAS	3621.50	6782.17	6867.15	2561.08	1243.10	2462.57	1679.95	808.11	3621.50
40.	SON	2830.68	1240.09	1226.80	3807.04	7334.92	3903.05	4691.14	6251.43	2830.68
41.	SHA	3111.38	1807.33	1907.20	3397.27	6048.54	3432.84	3953.23	5029.77	3111.38
42.	SUK	785.62	2812.78	2867.20	1794.51	5397.77	1898.08	2703.63	4333.67	785.62
43.	TAN	3371.17	348.60	333.38	4199.72	7535.42	4281.71	5019.23	6455.28	3371.17
44.	TSW	3111.38	1807.33	1907.20	3397.27	6048.54	3432.84	3953.23	5029.77	3111.38
45.	VEN	3111.38	1807.33	1907.20	3397.27	6048.54	3432.84	3953.23	5029.77	3111.38
46.	YOR	2715.15	5767.50	5852.86	1611.92	2005.69	1505.85	699.31	999.83	2715.15

C-11. Continued.

	TRIBE	10.	11.	12.	13.	14.	15.	16.	17.	18.
1.	AKA	3286.88	1973.67	1890.49	3860.79	2491.81	1509.63	2487.64	3591.85	3692.42
2.	ADY	456.11	3369.17	4889.96	7020.68	2755.53	3274.03	3228.65	6839.45	6922.03
3.	ASY	444.50	3464.05	4973.46	7106.09	2855.15	3363.16	3327.91	6922.03	7005.29
4.	BAB	4132.39	1670.48	776.79	2803.65	2454.42	1351.73	2233.23	2564.40	2658.54
5.	BAG	7494.98	4206.17	2865.68	1074.24	4925.06	4312.61	4456.82	1414.92	1315.89
6.	BAK	4216.06	1666.82	665.82	2705.38	2466.56	1374.24	2225.13	2471.53	2564.40
7.	BAM	4960.57	2041.29	248.36	1922.58	2882.72	1909.79	2531.89	1718.81	1803.55
8.	BAO	6413.09	3148.15	1803.30	888.98	3899.72	3232.02	3442.67	1052.33	1023.64
9.	BAS	3286.88	1973.67	1890.49	3860.79	2491.81	1509.63	2487.64	3591.85	3692.42
10.	BEO	0.00	3342.27	4739.43	6878.44	2824.77	3182.53	3282.08	6675.59	6763.16
11.	BIE	3342.27	0.00	1793.74	3770.73	841.49	467.48	565.93	3656.91	3720.91
12.	BKO	4739.43	1793.74	0.00	2139.04	2635.21	1664.89	2289.11	1950.79	2032.11
13.	BOZ	6878.44	3770.73	2139.04	0.00	4575.27	3758.96	4144.14	341.34	242.17
14.	BUS	2824.77	841.49	2635.21	4575.27	0.00	1111.22	477.56	4479.48	4539.18
15.	CHO	3182.53	467.48	1664.89	3758.96	1111.22	0.00	988.68	3603.30	3678.26
16.	CUA	3282.08	565.93	2289.11	4144.14	477.56	988.68	0.00	4066.80	4121.11
17.	DOG1	6675.59	3656.91	1950.79	341.34	4479.48	3603.30	4066.80	0.00	107.29
18.	DOG2	6763.16	3720.91	2032.11	242.17	4539.18	3678.26	4121.11	107.29	0.00
19.	DYO	7843.77	4576.88	3167.79	1193.63	5308.31	4664.76	4842.40	1525.45	1418.92
20.	EFE	3219.61	2043.46	2001.32	3963.94	2532.19	1577.16	2547.32	3692.42	3793.47
21.	EFE2	3442.85	1999.58	1775.49	3716.71	2561.63	1542.49	2528.90	3444.27	3545.43
22.	FAL1	5064.23	2484.24	808.55	2005.54	3312.51	2248.78	3018.31	1718.77	1821.69
23.	FAL2	5064.23	2484.24	808.55	2005.54	3312.51	2248.78	3018.31	1718.77	1821.69
24.	FAL3	5064.23	2484.24	808.55	2005.54	3312.51	2248.78	3018.31	1718.77	1821.69
25.	FOU	4988.92	2375.00	702.38	2036.27	3204.51	2144.94	2907.89	1760.48	1861.44
26.	FUL	6675.59	3656.91	1950.79	341.34	4479.48	3603.30	4066.80	0.00	107.29
27.	GIN	3575.10	350.80	1443.89	3448.64	1191.74	438.99	888.98	3323.08	3389.94
28.	HEH	1865.41	2125.47	3028.64	5139.48	2114.48	1761.77	2386.33	4904.03	4998.33
29.	KIR	5062.30	2577.14	948.46	2087.33	3397.81	2319.27	3119.13	1787.81	1892.80
30.	KUR	6699.73	3633.11	1963.00	215.65	4447.85	3600.40	4026.30	154.66	111.12
31.	KUS	6270.44	3150.62	1535.59	621.70	3959.48	3138.86	3534.09	566.09	596.45
32.	LES	3219.61	2043.46	2001.32	3963.94	2532.19	1577.16	2547.32	3692.42	3793.47
33.	LUI	3384.16	111.10	1691.25	3687.02	945.39	396.43	675.39	3566.81	3632.46
34.	MAM	5338.40	2434.73	647.11	1566.20	3275.61	2309.42	2913.77	1337.53	1427.44
35.	MAN	4132.39	1670.48	776.79	2803.65	2454.42	1351.73	2233.23	2564.40	2658.54
36.	MER	222.25	3300.19	4631.67	6769.20	2833.97	3110.38	3279.55	6557.01	6646.66
37.	NOB	2012.04	1935.58	3705.04	5699.61	1130.56	2068.91	1591.87	5592.43	5655.78
38.	PED	2012.04	1935.58	3705.04	5699.61	1130.56	2068.91	1591.87	5592.43	5655.78
39.	SAS	6637.05	3546.46	1897.76	242.99	4357.28	3524.12	3932.22	247.00	222.24
40.	SON	785.03	3361.48	4492.70	6607.76	3030.97	3096.84	3438.98	6370.32	6465.33
41.	SHA	2012.04	1935.58	3705.04	5699.61	1130.56	2068.91	1591.87	5592.43	5655.78
42.	SUK	2508.80	2024.92	2532.87	4592.85	2270.90	1583.18	2421.05	4339.12	4437.00
43.	TAN	111.12	3368.13	4795.71	6934.25	2826.28	3223.32	3288.48	6736.08	6822.59
44.	TSW	2012.04	1935.58	3705.04	5699.61	1130.56	2068.91	1591.87	5592.43	5655.78
45.	VEN	2012.04	1935.58	3705.04	5699.61	1130.56	2068.91	1591.87	5592.43	5655.78
46.	YOR	5628.60	2553.65	893.18	1253.25	3379.01	2510.09	2974.96	1103.56	1171.42

C-11. Continued.

	TRIBE	19.	20.	21.	22.	23.	24.	25.	26.	27.
1.	AKA	4989.43	111.05	157.05	1879.74	1879.74	1879.74	1831.43	3591.85	1805.56
2.	AOY	7930.28	3515.03	3725.40	5281.95	5281.95	5281.95	5199.77	6839.45	3635.73
3.	ASY	8021.91	3572.32	3785.75	5355.76	5355.76	5355.76	5274.68	6922.03	3728.09
4.	BAB	3896.95	1226.20	998.72	953.63	953.63	953.63	865.78	2564.40	1351.73
5.	BAG	398.18	4829.21	4588.81	2953.84	2953.84	2953.84	2960.40	1414.92	3932.84
6.	BAK	3791.85	1336.80	1109.69	894.34	894.34	894.34	799.84	2471.53	1338.05
7.	BAN	2985.86	2133.29	1897.39	646.43	646.43	646.43	554.08	1718.81	1691.73
8.	BAO	1434.01	3793.97	3559.84	2029.40	2029.40	2029.40	2010.52	1052.33	2861.58
9.	BAS	4989.43	111.05	157.05	1879.74	1879.74	1879.74	1831.43	3591.85	1805.56
10.	BEO	7843.77	3219.61	3442.85	5064.23	5064.23	5064.23	4988.92	6675.59	3575.10
11.	BIE	4576.88	2043.46	1999.58	2484.24	2484.24	2484.24	2375.00	3656.91	350.80
12.	BKO	3167.79	2001.32	1775.49	808.55	808.55	808.55	702.38	1950.79	1443.89
13.	BOZ	1193.63	3963.94	3716.71	2005.54	2005.54	2005.54	2036.27	341.34	3448.64
14.	BUS	5308.31	2532.19	2561.63	3312.51	3312.51	3312.51	3204.51	4479.48	1191.74
15.	CHO	4664.76	1577.16	1542.49	2248.78	2248.78	2248.78	2144.94	3603.30	438.99
16.	CUA	4842.40	2547.32	2528.90	3018.31	3018.31	3018.31	2907.89	4066.80	888.98
17.	DOG1	1525.45	3692.42	3444.27	1718.77	1718.77	1718.77	1760.48	0.00	3323.08
18.	DOG2	1418.92	3793.47	3545.43	1821.69	1821.69	1821.69	1861.44	107.29	3389.94
19.	DYO	0.00	5095.98	4851.93	3173.59	3173.59	3173.59	3192.41	1525.45	4295.08
20.	EFE	5095.98	0.00	248.29	1977.71	1977.71	1977.71	1932.07	3692.42	1888.55
21.	EFE2	4851.93	248.29	0.00	1729.45	1729.45	1729.45	1684.01	3444.27	1806.26
22.	FAL1	3173.59	1977.71	1729.45	0.00	0.00	0.00	111.08	1718.77	2137.21
23.	FAL2	3173.59	1977.71	1729.45	0.00	0.00	0.00	111.08	1718.77	2137.21
24.	FAL3	3173.59	1977.71	1729.45	0.00	0.00	0.00	111.08	1718.77	2137.21
25.	FOU	3192.41	1932.07	1684.01	111.08	111.08	111.08	0.00	1760.48	2027.54
26.	FUL	1525.45	3692.42	3444.27	1718.77	1718.77	1718.77	1760.48	0.00	3323.08
27.	GIN	4295.08	1888.55	1806.26	2137.21	2137.21	2137.21	2027.54	3323.08	0.00
28.	HEH	6195.49	1355.23	1577.75	3236.77	3236.77	3236.77	3170.47	4904.03	2200.54
29.	KIR	3266.50	1933.08	1685.96	155.80	155.80	155.80	247.69	1787.81	2233.39
30.	KUR	1408.87	3758.00	3510.40	1794.36	1794.36	1794.36	1827.88	154.66	3304.64
31.	KUS	1666.64	3429.36	3185.40	1531.95	1531.95	1531.95	1538.26	566.09	2827.19
32.	LES	5095.98	0.00	248.29	1977.71	1977.71	1977.71	1932.07	3692.42	1888.55
33.	LUI	4511.81	1961.17	1908.60	2375.03	2375.03	2375.03	2265.97	3566.81	247.70
34.	MAN	2678.92	2417.24	2173.03	592.04	592.04	592.04	560.62	1337.53	2086.37
35.	MAN	3896.95	1226.20	998.72	953.63	953.63	953.63	865.78	2564.40	1351.73
36.	MER	7758.10	3051.40	3279.55	4925.06	4925.06	4925.06	4853.00	6557.01	3515.15
37.	NOB	6434.20	3113.24	3224.30	4316.37	4316.37	4316.37	4213.34	5592.43	2273.73
38.	PEO	6434.20	3113.24	3224.30	4316.37	4316.37	4316.37	4213.34	5592.43	2273.73
39.	SAS	1407.40	3725.15	3478.24	1773.41	1773.41	1773.41	1800.40	247.00	3220.76
40.	SON	7655.99	2745.87	2987.06	4689.95	4689.95	4689.95	4628.45	6370.32	3525.43
41.	SHA	6434.20	3113.24	3224.30	4316.37	4316.37	4316.37	4213.34	5592.43	2273.73
42.	SUK	5689.44	711.43	942.69	2643.09	2643.09	2643.09	2585.61	4339.12	1992.60
43.	TAN	7887.47	3305.91	3526.68	5135.54	5135.54	5135.54	5058.70	6736.08	3609.33
44.	TSW	6434.20	3113.24	3224.30	4316.37	4316.37	4316.37	4213.34	5592.43	2273.73
45.	VEN	6434.20	3113.24	3224.30	4316.37	4316.37	4316.37	4213.34	5592.43	2273.73
46.	YOR	2286.58	2823.63	2583.91	1043.64	1043.64	1043.64	1014.91	1103.56	2219.69

C-11. Continued.

	TRIBE	28.	29.	30.	31.	32.	33.	34.	35.	36.
1.	AKA	1421.58	1839.59	3655.61	3322.88	111.05	1888.17	2311.10	1115.69	3122.88
2.	ADY	2166.32	5293.39	6851.79	6404.33	3515.03	3425.13	5509.13	4335.11	674.64
3.	ASY	2220.13	5364.91	6935.91	6490.54	3572.32	3518.97	5590.24	4410.78	666.75
4.	BAB	2339.82	992.26	2608.01	2235.91	1226.20	1559.62	1237.47	0.00	4002.73
5.	BAG	5882.37	3060.22	1275.24	1422.54	4829.21	4144.50	2424.27	3614.78	7416.22
6.	BAK	2435.02	948.46	2511.65	2132.83	1336.80	1555.70	1139.75	110.92	4089.76
7.	BAM	3223.68	798.80	1739.36	1332.78	2133.29	1939.20	399.86	914.19	4847.59
8.	BAO	4802.69	2159.88	915.48	625.49	3793.97	3080.45	1450.81	2569.22	6331.89
9.	BAS	1421.58	1839.59	3655.61	3322.88	111.05	1888.17	2311.10	1115.69	3122.88
10.	BEO	1865.41	5062.30	6699.73	6270.44	3219.61	3384.16	5338.40	4132.39	222.25
11.	BIE	2125.47	2577.14	3633.11	3150.62	2043.46	111.10	2434.73	1670.48	3300.19
12.	BKO	3028.64	948.46	1363.00	1535.59	2001.32	1691.25	647.11	776.79	4631.67
13.	BOZ	5139.48	2087.33	215.65	621.70	3963.94	3687.02	1566.20	2803.65	6769.20
14.	BUS	2114.48	3397.81	4447.85	3959.48	2532.19	945.39	3275.61	2454.42	2833.97
15.	CHO	1761.77	2319.27	3600.40	3138.86	1577.16	396.43	2309.42	1351.73	3110.38
16.	CUA	2386.33	3119.13	4026.30	3534.09	2547.32	675.39	2913.77	2233.23	3279.55
17.	DOG1	4904.03	1787.81	154.66	566.09	3692.42	3566.81	1337.53	2564.40	6557.01
18.	DOG2	4998.33	1892.80	111.12	596.45	3793.47	3632.46	1427.44	2658.54	6646.66
19.	DYO	6195.49	3266.50	1408.87	1666.64	5095.98	4511.81	2678.92	3896.95	7758.10
20.	EFE	1355.23	1933.08	3758.00	3429.36	0.00	1961.17	2417.24	1226.20	3051.40
21.	EFE2	1577.75	1685.96	3510.40	3185.40	248.29	1908.60	2173.03	998.72	3279.55
22.	FAL1	3236.77	155.80	1794.36	1531.95	1977.71	2375.03	592.04	953.63	4925.06
23.	FAL2	3236.77	155.80	1794.36	1531.95	1977.71	2375.03	592.04	953.63	4925.06
24.	FAL3	3236.77	155.80	1794.36	1531.95	1977.71	2375.03	592.04	953.63	4925.06
25.	FOU	3170.47	247.69	1827.88	1538.26	1932.07	2265.97	560.62	865.78	4853.00
26.	FUL	4904.03	1787.81	154.66	566.09	3692.42	3566.81	1337.53	2564.40	6557.01
27.	GIN	2200.54	2233.39	3304.64	2827.19	1888.55	247.70	2086.37	1351.73	3515.15
28.	HEH	0.00	3220.98	4946.65	4556.22	1355.23	2108.35	3574.70	2339.82	1703.36
29.	KIR	3220.98	0.00	1873.62	1642.49	1933.08	2467.01	737.18	992.26	4917.21
30.	KUR	4946.65	1873.62	0.00	494.78	3758.00	3546.01	1372.08	2608.01	6586.41
31.	KUS	4556.22	1642.49	494.78	0.00	3429.36	3066.08	1012.40	2235.91	6166.23
32.	LES	1355.23	1933.08	3758.00	3429.36	0.00	1961.17	2417.24	1226.20	3051.40
33.	LUI	2108.35	2467.01	3546.01	3066.08	1961.17	0.00	2334.07	1559.62	3334.97
34.	MAM	3574.70	737.18	1372.08	1012.40	2417.24	2334.07	0.00	1237.47	5219.65
35.	MAN	2339.82	992.26	2608.01	2235.91	1226.20	1559.62	1237.47	0.00	4002.73
36.	MER	1703.36	4917.21	6586.41	6166.23	3051.40	3334.97	5219.65	4002.73	0.00
37.	NOB	2171.57	4381.22	5566.88	5081.56	3113.24	2027.62	4351.73	3397.27	2097.02
38.	PED	2171.57	4381.22	5566.88	5081.56	3113.24	2027.62	4351.73	3397.27	2097.02
39.	SAS	4896.53	1860.70	111.10	398.18	3725.15	3460.83	1323.64	2561.08	6526.98
40.	SDN	1468.31	4663.96	6414.59	6023.25	2745.87	3377.16	5042.78	3807.04	565.73
41.	SHA	2171.57	4381.22	5566.88	5081.56	3113.24	2027.62	4351.73	3397.27	2097.02
42.	SUK	647.11	2614.08	4393.02	4030.37	711.43	1974.54	3028.64	1794.51	2340.04
43.	TAN	1950.76	5136.47	6757.63	6324.05	3305.91	3413.43	5399.63	4199.72	333.38
44.	TSW	2171.57	4381.22	5566.88	5081.56	3113.24	2027.62	4351.73	3397.27	2097.02
45.	VEN	2171.57	4381.22	5566.88	5081.56	3113.24	2027.62	4351.73	3397.27	2097.02
46.	YOR	3917.75	1183.87	1090.50	642.66	2823.63	2463.27	454.47	1611.92	5523.63

C-11. Continued.

	TRIBE	37.	38.	39.	40.	41.	42.	43.	44.	45.
1.	AKA	3111.38	3111.38	3621.50	2830.68	3111.38	785.62	3371.17	3111.38	3111.38
2.	AOY	1807.33	1807.33	6782.17	1240.09	1807.33	2812.78	348.60	1807.33	1807.33
3.	ASY	1907.20	1907.20	6867.15	1226.80	1907.20	2867.20	333.38	1907.20	1907.20
4.	BAB	3397.27	3397.27	2561.08	3807.04	3397.27	1794.51	4199.72	3397.27	3397.27
5.	BAG	6048.54	6048.54	1243.10	7334.92	6048.54	5397.77	7535.42	6048.54	6048.54
6.	BAK	3432.84	3432.84	2462.57	3903.05	3432.84	1898.08	4281.71	3432.84	3432.84
7.	BAM	3953.23	3953.23	1679.95	4691.14	3953.23	2703.63	5019.23	3953.23	3953.23
8.	BAO	5029.77	5029.77	808.11	6251.43	5029.77	4333.67	6455.28	5029.77	5029.77
9.	BAS	3111.38	3111.38	3621.50	2830.68	3111.38	785.62	3371.17	3111.38	3111.38
10.	BEO	2012.04	2012.04	6637.05	785.03	2012.04	2508.80	111.12	2012.04	2012.04
11.	BIE	1935.58	1935.58	3546.46	3361.48	1935.58	2024.92	3368.13	1935.58	1935.58
12.	BKO	3705.04	3705.04	1897.76	4492.70	3705.04	2532.87	4795.71	3705.04	3705.04
13.	BOZ	5699.61	5699.61	242.99	6607.76	5699.61	4592.85	6934.25	5699.61	5699.61
14.	BUS	1130.56	1130.56	4357.28	3030.97	1130.56	2270.90	2826.28	1130.56	1130.56
15.	CHO	2068.91	2068.91	3524.12	3096.84	2068.91	1583.18	3223.32	2068.91	2068.91
16.	CUA	1591.87	1591.87	3932.22	3438.98	1591.87	2421.05	3288.48	1591.87	1591.87
17.	DOG1	5592.43	5592.43	247.00	6370.32	5592.43	4339.12	6736.08	5592.43	5592.43
18.	DOG2	5655.78	5655.78	222.24	6465.33	5655.78	4437.00	6822.59	5655.78	5655.78
19.	DYO	6434.20	6434.20	1407.40	7655.99	6434.20	5689.44	7887.47	6434.20	6434.20
20.	EFE	3113.24	3113.24	3725.15	2745.87	3113.24	711.43	3305.91	3113.24	3113.24
21.	EFE2	3224.30	3224.30	3478.24	2987.06	3224.30	942.69	3526.68	3224.30	3224.30
22.	FAL1	4316.37	4316.37	1773.41	4689.95	4316.37	2643.09	5135.54	4316.37	4316.37
23.	FAL2	4316.37	4316.37	1773.41	4689.95	4316.37	2643.09	5135.54	4316.37	4316.37
24.	FAL3	4316.37	4316.37	1773.41	4689.95	4316.37	2643.09	5135.54	4316.37	4316.37
25.	FOU	4213.34	4213.34	1800.40	4628.45	4213.34	2585.61	5058.70	4213.34	4213.34
26.	FUL	5592.43	5592.43	247.00	6370.32	5592.43	4339.12	6736.08	5592.43	5592.43
27.	GIN	2273.73	2273.73	3220.76	3525.43	2273.73	1992.60	3609.33	2273.73	2273.73
28.	HEH	2171.57	2171.57	4896.53	1468.31	2171.57	647.11	1950.76	2171.57	2171.57
29.	KIR	4381.22	4381.22	1860.70	4663.96	4381.22	2614.08	5136.47	4381.22	4381.22
30.	KUR	5566.88	5566.88	111.10	6414.59	5566.88	4393.02	6757.63	5566.88	5566.88
31.	KUS	5081.56	5081.56	398.18	6023.25	5081.56	4030.37	6324.05	5081.56	5081.56
32.	LES	3113.24	3113.24	3725.15	2745.87	3113.24	711.43	3305.91	3113.24	3113.24
33.	LUI	2027.62	2027.62	3460.83	3377.16	2027.62	1974.54	3413.43	2027.62	2027.62
34.	MAM	4351.73	4351.73	1323.64	5042.78	4351.73	3028.64	5399.63	4351.73	4351.73
35.	MAN	3397.27	3397.27	2561.08	3807.04	3397.27	1794.51	4199.72	3397.27	3397.27
36.	MER	2097.02	2097.02	6526.98	565.73	2097.02	2340.04	333.38	2097.02	2097.02
37.	NOB	0.00	0.00	5478.57	2472.22	0.00	2610.87	1977.28	0.00	0.00
38.	PEO	0.00	0.00	5478.57	2472.22	0.00	2610.87	1977.28	0.00	0.00
39.	SAS	5478.57	5478.57	0.00	6364.81	5478.57	4351.05	6693.37	5478.57	5478.57
40.	SON	2472.22	2472.22	6364.81	0.00	2472.22	2049.98	895.23	2472.22	2472.22
41.	SHA	0.00	0.00	5478.57	2472.22	0.00	2610.87	1977.28	0.00	0.00
42.	SUK	2610.87	2610.87	4351.05	2049.98	2610.87	0.00	2596.05	2610.87	2610.87
43.	TAN	1977.28	1977.28	6693.37	895.23	1977.28	2596.05	0.00	1977.28	1977.28
44.	TSW	0.00	0.00	5478.57	2472.22	0.00	2610.87	1977.28	0.00	0.00
45.	VEN	0.00	0.00	5478.57	2472.22	0.00	2610.87	1977.28	0.00	0.00
46.	YOR	4489.21	4489.21	1015.25	5383.67	4489.21	3402.91	5682.93	4489.21	4489.21

C-11. Continued.

	TRIBE	46.
1.	AKA	2715.15
2.	AOY	5767.50
3.	ASY	5852.86
4.	BAB	1611.92
5.	BAG	2005.69
6.	BAK	1505.85
7.	BAM	699.31
8.	BAO	999.83
9.	BAS	2715.15
10.	BEO	5628.60
11.	BIE	2553.65
12.	BKO	893.18
13.	BOZ	1253.25
14.	BUS	3379.01
15.	CHO	2510.09
16.	CUA	2974.96
17.	DOG1	1103.56
18.	DOG2	1171.42
19.	DYO	2286.58
20.	EFE	2823.63
21.	EFE2	2583.91
22.	FAL1	1043.64
23.	FAL2	1043.64
24.	FAL3	1043.64
25.	FOU	1014.91
26.	FUL	1103.56
27.	GIN	2219.69
28.	HEH	3917.75
29.	KIR	1183.87
30.	KUR	1090.50
31.	KUS	642.66
32.	LES	2823.63
33.	LUI	2463.27
34.	MAM	454.47
35.	MAN	1611.92
36.	MER	5523.63
37.	NDB	4489.21
38.	PED	4489.21
39.	SAS	1015.25
40.	SDN	5383.67
41.	SHA	4489.21
42.	SUK	3402.91
43.	TAN	5682.93
44.	TSW	4489.21
45.	VEN	4489.21
46.	YOR	0.00

C-12. Female Finger Sample Set Geographic Distance Matrix.

	TRIBE	1.	2.	3.	4.	5.	6.	7.	8.	9.
1.	AKA	0.00	1115.69	4720.82	1226.20	2023.83	3683.95	0.00	1973.67	1890.49
2.	BAB	1115.69	0.00	3614.78	110.92	914.19	2569.22	1115.69	1670.48	776.79
3.	BAG	4720.82	3614.78	0.00	3507.17	2700.63	1085.32	4720.82	4206.17	2865.68
4.	BAK	1226.20	110.92	3507.17	0.00	807.12	2459.45	1226.20	1666.82	665.82
5.	BAM	2023.83	914.19	2700.63	807.12	0.00	1662.80	2023.83	2041.29	248.36
6.	BAO	3683.95	2569.22	1085.32	2459.45	1662.80	0.00	3683.95	3148.15	1803.30
7.	BAS	0.00	1115.69	4720.82	1226.20	2023.83	3683.95	0.00	1973.67	1890.49
8.	BIE	1973.67	1670.48	4206.17	1666.82	2041.29	3148.15	1973.67	0.00	1793.74
9.	BKO	1890.49	776.79	2865.68	665.82	248.36	1803.30	1890.49	1793.74	0.00
10.	BUS	2491.81	2454.42	4925.06	2466.56	2882.72	3899.72	2491.81	841.49	2635.21
11.	CHO	1509.63	1351.73	4312.61	1374.24	1909.79	3232.02	1509.63	467.48	1664.89
12.	CUA	2487.64	2233.23	4456.82	2225.13	2531.89	3442.67	2487.64	565.93	2289.11
13.	DOG2	3692.42	2658.54	1315.89	2564.40	1803.55	1023.64	3692.42	3720.91	2032.11
14.	DYO	4989.43	3896.95	398.18	3791.85	2985.86	1434.01	4989.43	4576.88	3167.79
15.	EFE	111.05	1226.20	4829.21	1336.80	2133.29	3793.97	111.05	2043.46	2001.32
16.	EFE2	157.05	998.72	4588.81	1109.69	1897.39	3559.84	157.05	1999.58	1775.49
17.	FAL1	1879.74	953.63	2953.84	894.34	646.43	2029.40	1879.74	2484.24	808.55
18.	FAL2	1879.74	953.63	2953.84	894.34	646.43	2029.40	1879.74	2484.24	808.55
19.	FOU	1831.43	865.78	2960.40	799.84	554.08	2010.52	1831.43	2375.00	702.38
20.	GIN	1805.56	1351.73	3932.84	1338.05	1691.73	2861.58	1805.56	350.80	1443.89
21.	HEH	1421.58	2339.82	5882.37	2435.02	3223.68	4802.69	1421.58	2125.47	3028.64
22.	KIR	1839.59	992.26	3060.22	948.46	798.80	2159.88	1839.59	2577.14	948.46
23.	KUR	3655.61	2608.01	1275.24	2511.65	1739.36	915.48	3655.61	3633.11	1963.00
24.	LES	111.05	1226.20	4829.21	1336.80	2133.29	3793.97	111.05	2043.46	2001.32
25.	LUI	1888.17	1559.62	4144.50	1555.70	1939.20	3080.45	1888.17	111.10	1691.25
26.	MAM	2311.10	1237.47	2424.27	1139.75	399.86	1450.81	2311.10	2434.73	647.11
27.	MER	3122.88	4002.73	7416.22	4089.76	4847.59	6331.89	3122.88	3300.19	4631.67
28.	NOB	3111.38	3397.27	6048.54	3432.84	3953.23	5029.77	3111.38	1935.58	3705.04
29.	PED	3111.38	3397.27	6048.54	3432.84	3953.23	5029.77	3111.38	1935.58	3705.04
30.	SAS	3621.50	2561.08	1243.10	2462.57	1679.95	808.11	3621.50	3546.46	1897.76
31.	SDN	2830.68	3807.04	7334.92	3903.05	4691.14	6251.43	2830.68	3361.48	4492.70
32.	SHA	3111.38	3397.27	6048.54	3432.84	3953.23	5029.77	3111.38	1935.58	3705.04
33.	TSW	3111.38	3397.27	6048.54	3432.84	3953.23	5029.77	3111.38	1935.58	3705.04
34.	VEN	3111.38	3397.27	6048.54	3432.84	3953.23	5029.77	3111.38	1935.58	3705.04
35.	YOR	2715.15	1611.92	2005.69	1505.85	699.31	999.83	2715.15	2553.65	893.18

C-12. Continued.

	TRIBE	10.	11.	12.	13.	14.	15.	16.	17.	18.
1.	AKA	2491.81	1509.63	2487.64	3692.42	4989.43	111.05	157.05	1879.74	1879.74
2.	BAB	2454.42	1351.73	2233.23	2658.54	3896.95	1226.20	998.72	953.63	953.63
3.	BAG	4925.06	4312.61	4456.82	1315.89	398.18	4829.21	4588.81	2953.84	2953.84
4.	BAK	2466.56	1374.24	2225.13	2564.40	3791.85	1336.80	1109.69	894.34	894.34
5.	BAM	2882.72	1909.79	2531.89	1803.55	2985.86	2133.29	1897.39	646.43	646.43
6.	BAO	3839.72	3232.02	3442.67	1023.64	1434.01	3793.97	3559.84	2029.40	2029.40
7.	BAS	2491.81	1509.63	2487.64	3692.42	4989.43	111.05	157.05	1879.74	1879.74
8.	BIE	841.49	467.48	565.93	3720.91	4576.88	2043.46	1999.58	2484.24	2484.24
9.	BKO	2635.21	1664.89	2289.11	2032.11	3167.79	2001.32	1775.49	808.55	808.55
10.	BUS	0.00	1111.22	477.56	4539.18	5308.31	2532.19	2561.63	3312.51	3312.51
11.	CHO	1111.22	0.00	988.68	3678.26	4664.76	1577.16	1542.49	2248.78	2248.78
12.	CUA	477.56	988.68	0.00	4121.11	4842.40	2547.32	2528.90	3018.31	3018.31
13.	DOG2	4539.18	3678.26	4121.11	0.00	1418.92	3793.47	3545.43	1821.69	1821.69
14.	DYO	5308.31	4664.76	4842.40	1418.92	0.00	5095.98	4851.93	3173.59	3173.59
15.	EFE	2532.19	1577.16	2547.32	3793.47	5095.98	0.00	248.29	1977.71	1977.71
16.	EFE2	2561.63	1542.49	2528.90	3545.43	4851.93	248.29	0.00	1729.45	1729.45
17.	FAL1	3312.51	2248.78	3018.31	1821.69	3173.59	1977.71	1729.45	0.00	0.00
18.	FAL2	3312.51	2248.78	3018.31	1821.69	3173.59	1977.71	1729.45	0.00	0.00
19.	FOU	3204.51	2144.94	2907.89	1861.44	3192.41	1932.07	1684.01	111.08	111.08
20.	GIN	1191.74	438.99	888.98	3389.94	4295.08	1888.55	1806.26	2137.21	2137.21
21.	HEH	2114.48	1761.77	2386.33	4998.33	6195.49	1355.23	1577.75	3236.77	3236.77
22.	KIR	3397.81	2319.27	3119.13	1892.80	3266.50	1933.08	1685.96	155.80	155.80
23.	KUR	4447.85	3600.40	4026.30	111.12	1408.87	3758.00	3510.40	1794.36	1794.36
24.	LES	2532.19	1577.16	2547.32	3793.47	5095.98	0.00	248.29	1977.71	1977.71
25.	LUI	945.39	396.43	675.39	3632.46	4511.81	1961.17	1908.60	2375.03	2375.03
26.	MAM	3275.61	2309.42	2913.77	1427.44	2678.92	2417.24	2173.03	592.04	592.04
27.	MER	2833.37	3110.38	3279.55	6646.66	7758.10	3051.40	3279.55	4925.06	4925.06
28.	NDB	1130.56	2068.91	1591.87	5655.78	6434.20	3113.24	3224.30	4316.37	4316.37
29.	PED	1130.56	2068.91	1591.87	5655.78	6434.20	3113.24	3224.30	4316.37	4316.37
30.	SAS	4357.28	3524.12	3932.22	222.24	1407.40	3725.15	3478.24	1773.41	1773.41
31.	SDN	3030.97	3096.84	3438.98	6465.33	7655.99	2745.87	2987.06	4689.95	4689.95
32.	SHA	1130.56	2068.91	1591.87	5655.78	6434.20	3113.24	3224.30	4316.37	4316.37
33.	TSW	1130.56	2068.91	1591.87	5655.78	6434.20	3113.24	3224.30	4316.37	4316.37
34.	VEN	1130.56	2068.91	1591.87	5655.78	6434.20	3113.24	3224.30	4316.37	4316.37
35.	YOR	3379.01	2510.09	2974.96	1171.42	2286.58	2823.63	2583.91	1043.64	1043.64

C-12. Continued.

	TRIBE	19.	20.	21.	22.	23.	24.	25.	26.	27.
1.	AKA	1831.43	1805.56	1421.58	1839.59	3655.61	111.05	1888.17	2311.10	3122.88
2.	BAB	865.78	1351.73	2339.82	992.26	2608.01	1226.20	1559.62	1237.47	4002.73
3.	BAG	2960.40	3932.84	5882.37	3060.22	1275.24	4829.21	4144.50	2424.27	7416.22
4.	BAK	739.84	1338.05	2435.02	948.46	2511.65	1336.80	1555.70	1139.75	4089.76
5.	BAM	554.08	1691.73	3223.68	798.80	1739.36	2133.29	1939.20	399.86	4847.59
6.	BAO	2010.52	2861.58	4802.69	2159.88	915.48	3793.97	3080.45	1450.81	6331.89
7.	BAS	1831.43	1805.56	1421.58	1839.59	3655.61	111.05	1888.17	2311.10	3122.88
8.	BIE	2375.00	350.80	2125.47	2577.14	3633.11	2043.46	111.10	2434.73	3300.19
9.	BKO	702.38	1443.89	3028.64	948.46	1963.00	2001.32	1691.25	647.11	4631.67
10.	BUS	3204.51	1191.74	2114.48	3397.81	4447.85	2532.19	945.39	3275.61	2833.97
11.	CHO	2144.94	438.99	1761.77	2319.27	3600.40	1577.16	396.43	2309.42	3110.38
12.	CUA	2907.89	888.98	2386.33	3119.13	4026.30	2547.32	675.39	2913.77	3279.55
13.	DOG2	1861.44	3389.94	4938.33	1892.80	111.12	3793.47	3632.46	1427.44	6646.66
14.	DYO	3192.41	4295.08	6195.49	3266.50	1408.87	5095.98	4511.81	2678.92	7758.10
15.	EFE	1932.07	1888.55	1355.23	1933.08	3758.00	0.00	1961.17	2417.24	3051.40
16.	EFE2	1684.01	1806.26	1577.75	1685.96	3510.40	248.29	1908.60	2173.03	3279.55
17.	FAL1	111.08	2137.21	3236.77	155.80	1794.36	1977.71	2375.03	592.04	4925.06
18.	FAL2	111.08	2137.21	3236.77	155.80	1794.36	1977.71	2375.03	592.04	4925.06
19.	FOU	0.00	2027.54	3170.47	247.69	1827.88	1932.07	2265.97	560.62	4853.00
20.	GIN	2027.54	0.00	2200.54	2233.39	3304.64	1888.55	247.70	2086.37	3515.15
21.	HEH	3170.47	2200.54	0.00	3220.98	4946.65	1355.23	2108.35	3574.70	1703.36
22.	KIR	247.69	2233.39	3220.98	0.00	1873.62	1933.08	2467.01	737.18	4917.21
23.	KUR	1827.88	3304.64	4946.65	1873.62	0.00	3758.00	3546.01	1372.08	6586.41
24.	LES	1932.07	1888.55	1355.23	1933.08	3758.00	0.00	1961.17	2417.24	3051.40
25.	LUI	2265.97	247.70	2108.35	2467.01	3546.01	1961.17	0.00	2334.07	3334.97
26.	MAM	560.62	2086.37	3574.70	737.18	1372.08	2417.24	2334.07	0.00	5219.65
27.	MER	4853.00	3515.15	1703.36	4917.21	6586.41	3051.40	3334.97	5219.65	0.00
28.	NOB	4213.34	2273.73	2171.57	4381.22	5566.88	3113.24	2027.62	4351.73	2097.02
29.	PED	4213.34	2273.73	2171.57	4381.22	5566.88	3113.24	2027.62	4351.73	2097.02
30.	SAS	1800.40	3220.76	4896.53	1860.70	111.10	3725.15	3460.83	1323.64	6526.98
31.	SON	4628.45	3525.43	1468.31	4663.96	6414.59	2745.87	3377.16	5042.78	565.73
32.	SHA	4213.34	2273.73	2171.57	4381.22	5566.88	3113.24	2027.62	4351.73	2097.02
33.	TSW	4213.34	2273.73	2171.57	4381.22	5566.88	3113.24	2027.62	4351.73	2097.02
34.	VEN	4213.34	2273.73	2171.57	4381.22	5566.88	3113.24	2027.62	4351.73	2097.02
35.	YOR	1014.91	2219.69	3917.75	1183.87	1090.50	2823.63	2463.27	454.47	5523.63

C-12. Continued.

	TRIBE	28.	29.	30.	31.	32.	33.	34.	35.
1.	AKA	3111.38	3111.38	3621.50	2830.68	3111.38	3111.38	3111.38	2715.15
2.	BAB	3397.27	3397.27	2561.08	3807.04	3397.27	3397.27	3397.27	1611.92
3.	BAG	6048.54	6048.54	1243.10	7334.92	6048.54	6048.54	6048.54	2005.69
4.	BAK	3432.84	3432.84	2462.57	3903.05	3432.84	3432.84	3432.84	1505.85
5.	BAM	3953.23	3953.23	1679.95	4631.14	3953.23	3953.23	3953.23	699.31
6.	BAO	5029.77	5029.77	808.11	6251.43	5029.77	5029.77	5029.77	999.83
7.	BAS	3111.38	3111.38	3621.50	2830.68	3111.38	3111.38	3111.38	2715.15
8.	BIE	1935.58	1935.58	3546.46	3361.48	1935.58	1935.58	1935.58	2553.65
9.	BKO	3705.04	3705.04	1897.76	4492.70	3705.04	3705.04	3705.04	893.18
10.	BUS	1130.56	1130.56	4357.28	3030.97	1130.56	1130.56	1130.56	3379.01
11.	CHO	2068.91	2068.91	3524.12	3096.84	2068.91	2068.91	2068.91	2510.09
12.	CUA	1591.87	1591.87	3932.22	3438.98	1591.87	1591.87	1591.87	2974.96
13.	DOG2	5655.78	5655.78	222.24	6465.33	5655.78	5655.78	5655.78	1171.42
14.	DYO	6434.20	6434.20	1407.40	7655.99	6434.20	6434.20	6434.20	2286.58
15.	EFE	3113.24	3113.24	3725.15	2745.87	3113.24	3113.24	3113.24	2823.63
16.	EFE2	3224.30	3224.30	3478.24	2987.06	3224.30	3224.30	3224.30	2583.91
17.	FAL1	4316.37	4316.37	1773.41	4689.95	4316.37	4316.37	4316.37	1043.64
18.	FAL2	4316.37	4316.37	1773.41	4689.95	4316.37	4316.37	4316.37	1043.64
19.	FOU	4213.34	4213.34	1800.40	4628.45	4213.34	4213.34	4213.34	1014.91
20.	GIN	2273.73	2273.73	3220.76	3525.43	2273.73	2273.73	2273.73	2219.69
21.	HEH	2171.57	2171.57	4896.53	1468.31	2171.57	2171.57	2171.57	3917.75
22.	KIR	4381.22	4381.22	1860.70	4663.96	4381.22	4381.22	4381.22	1183.87
23.	KUR	5566.88	5566.88	111.10	6414.59	5566.88	5566.88	5566.88	1090.50
24.	LES	3113.24	3113.24	3725.15	2745.87	3113.24	3113.24	3113.24	2823.63
25.	LUI	2027.62	2027.62	3460.83	3377.16	2027.62	2027.62	2027.62	2463.27
26.	MAM	4351.73	4351.73	1323.64	5042.78	4351.73	4351.73	4351.73	454.47
27.	MER	2097.02	2097.02	6526.98	565.73	2097.02	2097.02	2097.02	5523.63
28.	NDB	0.00	0.00	5478.57	2472.22	0.00	0.00	0.00	4489.21
29.	PED	0.00	0.00	5478.57	2472.22	0.00	0.00	0.00	4489.21
30.	SAS	5478.57	5478.57	0.00	6364.81	5478.57	5478.57	5478.57	1015.25
31.	SDN	2472.22	2472.22	6364.81	0.00	2472.22	2472.22	2472.22	5383.67
32.	SHA	0.00	0.00	5478.57	2472.22	0.00	0.00	0.00	4489.21
33.	TSW	0.00	0.00	5478.57	2472.22	0.00	0.00	0.00	4489.21
34.	VEN	0.00	0.00	5478.57	2472.22	0.00	0.00	0.00	4489.21
35.	YOR	4489.21	4489.21	1015.25	5383.67	4489.21	4489.21	4489.21	0.00

C-13. Male Palmar Sample Set Geographic Distance Matrix.

	TRIBE	1.	2.	3.	4.	5.	6.	7.	8.	9.
1.	AKA	0.00	3572.32	3631.89	4720.82	1226.20	2023.83	3683.95	0.00	3286.88
2.	AOY	3572.32	0.00	100.74	7568.02	4410.78	5120.95	6496.37	3572.32	456.11
3.	ASY	3631.89	100.74	0.00	7660.78	4487.76	5203.28	6587.93	3631.89	444.50
4.	BAG	4720.82	7568.02	7660.78	0.00	3507.17	2700.63	1085.32	4720.82	7494.98
5.	BAK	1226.20	4410.78	4487.76	3507.17	0.00	807.12	2459.45	1226.20	4216.06
6.	BAM	2023.83	5120.95	5203.28	2700.63	807.12	0.00	1662.80	2023.83	4960.57
7.	BAO	3683.95	6496.37	6587.93	1085.32	2459.45	1662.80	0.00	3683.95	6413.09
8.	BAS	0.00	3572.32	3631.89	4720.82	1226.20	2023.83	3683.95	0.00	3286.88
9.	BEO	3286.88	456.11	444.50	7494.98	4216.06	4960.57	6413.09	3286.88	0.00
10.	BIE	1973.67	3369.17	3464.05	4206.17	1666.82	2041.29	3148.15	1973.67	3342.27
11.	BOZ	3860.79	7020.68	7106.09	1074.24	2705.38	1922.58	888.98	3860.79	6878.44
12.	BUS	2491.81	2755.53	2855.15	4925.06	2466.56	2882.72	3899.72	2491.81	2824.77
13.	BWA	1115.69	4335.11	4410.78	3614.78	110.92	914.19	2569.22	1115.69	4132.39
14.	CHO	1509.63	3274.03	3363.16	4312.61	1374.24	1909.79	3232.02	1509.63	3182.53
15.	CUA	2487.64	3228.65	3327.91	4456.82	2225.13	2531.89	3442.67	2487.64	3282.08
16.	DOG1	3591.85	6839.45	6922.03	1414.92	2471.53	1718.81	1052.33	3591.85	6675.59
17.	DOG3	3692.42	6922.03	7005.29	1315.89	2564.40	1803.55	1023.64	3692.42	6763.16
18.	DYO	4989.43	7930.28	8021.91	398.18	3791.85	2985.86	1434.01	4989.43	7843.77
19.	EFE2	157.05	3725.40	3785.75	4588.81	1109.69	1897.39	3559.84	157.05	3442.85
20.	FAL1	1879.74	5281.95	5355.76	2953.84	894.34	646.43	2029.40	1879.74	5064.23
21.	FAL2	1879.74	5281.95	5355.76	2953.84	894.34	646.43	2029.40	1879.74	5064.23
22.	FAL3	1879.74	5281.95	5355.76	2953.84	894.34	646.43	2029.40	1879.74	5064.23
23.	FOU	1831.43	5199.77	5274.68	2960.40	799.84	554.08	2010.52	1831.43	4988.92
24.	FUL	3591.85	6839.45	6922.03	1414.92	2471.53	1718.81	1052.33	3591.85	6675.59
25.	GIN	1805.56	3635.73	3728.09	3932.84	1338.05	1691.73	2861.58	1805.56	3575.10
26.	HEH	1421.58	2166.32	2220.13	5882.37	2435.02	3223.68	4802.69	1421.58	1865.41
27.	KUR	3655.61	6851.79	6935.91	1275.24	2511.65	1739.36	915.48	3655.61	6699.73
28.	KUS	3322.88	6404.33	6490.54	1422.54	2132.83	1332.78	625.49	3322.88	6270.44
29.	LES	111.05	3515.03	3572.32	4829.21	1336.80	2133.29	3793.97	111.05	3219.61
30.	LUI	1888.17	3425.13	3518.97	4144.50	1555.70	1939.20	3080.45	1888.17	3384.16
31.	MAM	2311.10	5509.13	5590.24	2424.27	1139.75	399.86	1450.81	2311.10	5338.40
32.	MAN	1115.69	4335.11	4410.78	3614.78	110.92	914.19	2569.22	1115.69	4132.39
33.	MER	3122.88	674.64	666.75	7416.22	4089.76	4847.59	6331.89	3122.88	222.25
34.	NDB	3111.38	1807.33	1907.20	6048.54	3432.84	3953.23	5029.77	3111.38	2012.04
35.	PED	3111.38	1807.33	1907.20	6048.54	3432.84	3953.23	5029.77	3111.38	2012.04
36.	SAS	3621.50	6782.17	6867.15	1243.10	2462.57	1679.95	808.11	3621.50	6637.05
37.	SON	2830.68	1240.09	1226.80	7334.92	3903.05	4691.14	6251.43	2830.68	785.03
38.	SHA	3111.38	1807.33	1907.20	6048.54	3432.84	3953.23	5029.77	3111.38	2012.04
39.	SUK	785.62	2812.78	2867.20	5397.77	1898.08	2703.63	4333.67	785.62	2508.80
40.	TAN	3371.17	348.60	333.38	7535.42	4281.71	5019.23	6455.28	3371.17	111.12
41.	TSW	3111.38	1807.33	1907.20	6048.54	3432.84	3953.23	5029.77	3111.38	2012.04
42.	VEN	3111.38	1807.33	1907.20	6048.54	3432.84	3953.23	5029.77	3111.38	2012.04
43.	YOR	2715.15	5767.50	5852.86	2005.69	1505.85	699.31	999.83	2715.15	5628.60

C-13. Continued.

	TRIBE	10.	11.	12.	13.	14.	15.	16.	17.	18.
1.	AKA	1973.67	3860.79	2491.81	1115.69	1509.63	2487.64	3591.85	3692.42	4989.43
2.	AOY	3369.17	7020.68	2755.53	4335.11	3274.03	3228.65	6839.45	6922.03	7930.28
3.	ASY	3464.05	7106.09	2855.15	4410.78	3363.16	3327.91	6922.03	7005.29	8021.91
4.	BAG	4206.17	1074.24	4925.06	3614.78	4312.61	4456.82	1414.92	1315.89	398.18
5.	BAK	1666.82	2705.38	2466.56	110.92	1374.24	2225.13	2471.53	2564.40	3791.85
6.	BAN	2041.29	1922.58	2882.72	914.19	1909.79	2531.89	1718.81	1803.55	2985.86
7.	BAO	3148.15	888.98	3899.72	2569.22	3232.02	3442.67	1052.33	1023.64	1434.01
8.	BAS	1973.67	3860.79	2491.81	1115.69	1509.63	2487.64	3591.85	3692.42	4989.43
9.	BEO	3342.27	6878.44	2824.77	4132.39	3182.53	3282.08	6675.59	6763.16	7843.77
10.	BIE	0.00	3770.73	841.49	1670.48	467.48	565.93	3656.91	3720.91	4576.88
11.	BOZ	3770.73	0.00	4575.27	2803.65	3758.96	4144.14	341.34	242.17	1193.63
12.	BUS	841.49	4575.27	0.00	2454.42	1111.22	477.56	4479.48	4539.18	5308.31
13.	BWA	1670.48	2803.65	2454.42	0.00	1351.73	2233.23	2564.40	2658.54	3896.95
14.	CHO	467.48	3758.96	1111.22	1351.73	0.00	988.68	3603.30	3678.26	4664.76
15.	CUA	565.93	4144.14	477.56	2233.23	988.68	0.00	4066.80	4121.11	4842.40
16.	DOG1	3656.91	341.34	4479.48	2564.40	3603.30	4066.80	0.00	107.29	1525.45
17.	DOG3	3720.91	242.17	4539.18	2658.54	3678.26	4121.11	107.29	0.00	1418.92
18.	DYO	4576.88	1193.63	5308.31	3896.95	4664.76	4842.40	1525.45	1418.92	0.00
19.	EFE2	1999.58	3716.71	2561.63	998.72	1542.49	2528.90	3444.27	3545.43	4851.93
20.	FAL1	2484.24	2005.54	3312.51	953.63	2248.78	3018.31	1718.77	1821.69	3173.59
21.	FAL2	2484.24	2005.54	3312.51	953.63	2248.78	3018.31	1718.77	1821.69	3173.59
22.	FAL3	2484.24	2005.54	3312.51	953.63	2248.78	3018.31	1718.77	1821.69	3173.59
23.	FOU	2375.00	2036.27	3204.51	865.78	2144.94	2907.89	1760.48	1861.44	3192.41
24.	FUL	3656.91	341.34	4479.48	2564.40	3603.30	4066.80	0.00	107.29	1525.45
25.	GIN	350.80	3448.64	1191.74	1351.73	438.99	888.98	3323.08	3389.94	4295.08
26.	HEH	2125.47	5139.48	2114.48	2339.82	1761.77	2386.33	4904.03	4998.33	6195.49
27.	KUR	3633.11	215.65	4447.85	2608.01	3600.40	4026.30	154.66	111.12	1408.87
28.	KUS	3150.62	621.70	3959.48	2235.91	3138.86	3534.09	566.09	596.45	1666.64
29.	LES	2043.46	3963.94	2532.19	1226.20	1577.16	2547.32	3692.42	3793.47	5095.98
30.	LUI	111.10	3687.02	945.39	1559.62	396.43	675.39	3566.81	3632.46	4511.81
31.	MAN	2434.73	1566.20	3275.61	1237.47	2309.42	2913.77	1337.53	1427.44	2678.92
32.	MAN	1670.48	2803.65	2454.42	0.00	1351.73	2233.23	2564.40	2658.54	3896.95
33.	MER	3300.19	6769.20	2833.97	4002.73	3110.38	3279.55	6557.01	6646.66	7758.10
34.	NDB	1935.58	5699.61	1130.56	3397.27	2068.91	1591.87	5592.43	5655.78	6434.20
35.	PEO	1935.58	5699.61	1130.56	3397.27	2068.91	1591.87	5592.43	5655.78	6434.20
36.	SAS	3546.46	242.99	4357.28	2561.08	3524.12	3932.22	247.00	222.24	1407.40
37.	SDN	3361.48	6607.76	3030.97	3807.04	3096.84	3438.98	6370.32	6465.33	7655.99
38.	SHA	1935.58	5699.61	1130.56	3397.27	2068.91	1591.87	5592.43	5655.78	6434.20
39.	SUK	2024.92	4592.85	2270.90	1794.51	1583.18	2421.05	4339.12	4437.00	5689.44
40.	TAN	3368.13	6934.25	2826.28	4199.72	3223.32	3288.48	6736.08	6822.59	7887.47
41.	TSW	1935.58	5699.61	1130.56	3397.27	2068.91	1591.87	5592.43	5655.78	6434.20
42.	VEN	1935.58	5699.61	1130.56	3397.27	2068.91	1591.87	5592.43	5655.78	6434.20
43.	YOR	2553.65	1253.25	3379.01	1611.92	2510.09	2974.96	1103.56	1171.42	2286.58

C-13. Continued.

	TRIBE	19.	20.	21.	22.	23.	24.	25.	26.	27.
1.	AKA	157.05	1879.74	1879.74	1879.74	1831.43	3591.85	1805.56	1421.58	3655.61
2.	AOY	3725.40	5281.95	5281.95	5281.95	5199.77	6839.45	3635.73	2166.32	6851.79
3.	ASY	3785.75	5355.76	5355.76	5355.76	5274.68	6922.03	3728.09	2220.13	6935.91
4.	BAG	4588.81	2953.84	2953.84	2953.84	2960.40	1414.92	3932.84	5882.37	1275.24
5.	BAK	1109.69	894.34	894.34	894.34	799.84	2471.53	1338.05	2435.02	2511.65
6.	BAM	1897.39	646.43	646.43	646.43	554.08	1718.81	1691.73	3223.68	1739.36
7.	BAO	3559.84	2029.40	2029.40	2029.40	2010.52	1052.33	2861.58	4802.69	915.48
8.	BAS	157.05	1879.74	1879.74	1879.74	1831.43	3591.85	1805.56	1421.58	3655.61
9.	BEO	3442.85	5064.23	5064.23	5064.23	4988.92	6675.59	3575.10	1865.41	6699.73
10.	BIE	1999.58	2484.24	2484.24	2484.24	2375.00	3656.91	350.80	2125.47	3633.11
11.	BOZ	3716.71	2005.54	2005.54	2005.54	2036.27	341.34	3448.64	5139.48	215.65
12.	BUS	2561.63	3312.51	3312.51	3312.51	3204.51	4479.48	1191.74	2114.48	4447.85
13.	BWA	998.72	953.63	953.63	953.63	865.78	2564.40	1351.73	2339.82	2608.01
14.	CHO	1542.49	2248.78	2248.78	2248.78	2144.94	3603.30	438.99	1761.77	3600.40
15.	CUA	2528.90	3018.31	3018.31	3018.31	2907.89	4066.80	888.98	2386.33	4026.30
16.	DOG1	3444.27	1718.77	1718.77	1718.77	1760.48	0.00	3323.08	4904.03	154.66
17.	DOG3	3545.43	1821.69	1821.69	1821.69	1861.44	107.29	3389.94	4998.33	111.12
18.	DYO	4851.93	3173.59	3173.59	3173.59	3192.41	1525.45	4295.08	6195.49	1408.87
19.	EFE2	0.00	1729.45	1729.45	1729.45	1684.01	3444.27	1806.26	1577.75	3510.40
20.	FAL1	1729.45	0.00	0.00	0.00	111.08	1718.77	2137.21	3236.77	1794.36
21.	FAL2	1729.45	0.00	0.00	0.00	111.08	1718.77	2137.21	3236.77	1794.36
22.	FAL3	1729.45	0.00	0.00	0.00	111.08	1718.77	2137.21	3236.77	1794.36
23.	FOU	1684.01	111.08	111.08	111.08	0.00	1760.48	2027.54	3170.47	1827.88
24.	FUL	3444.27	1718.77	1718.77	1718.77	1760.48	0.00	3323.08	4904.03	154.66
25.	GIN	1806.26	2137.21	2137.21	2137.21	2027.54	3323.08	0.00	2200.54	3304.64
26.	HEH	1577.75	3236.77	3236.77	3236.77	3170.47	4904.03	2200.54	0.00	4946.65
27.	KUR	3510.40	1794.36	1794.36	1794.36	1827.88	154.66	3304.64	4946.65	0.00
28.	KUS	3105.40	1531.95	1531.95	1531.95	1538.26	566.09	2827.19	4556.22	494.78
29.	LES	248.29	1977.71	1977.71	1977.71	1932.07	3692.42	1888.55	1355.23	3758.00
30.	LUI	1908.60	2375.03	2375.03	2375.03	2265.97	3566.81	247.70	2108.35	3546.01
31.	MAM	2173.03	592.04	592.04	592.04	560.62	1337.53	2086.37	3574.70	1372.08
32.	MAN	998.72	953.63	953.63	953.63	865.78	2564.40	1351.73	2339.82	2608.01
33.	MER	3279.55	4925.06	4925.06	4925.06	4853.00	6557.01	3515.15	1703.36	6586.41
34.	NDB	3224.30	4316.37	4316.37	4316.37	4213.34	5592.43	2273.73	2171.57	5566.88
35.	PED	3224.30	4316.37	4316.37	4316.37	4213.34	5592.43	2273.73	2171.57	5566.88
36.	SAS	3478.24	1773.41	1773.41	1773.41	1800.40	247.00	3220.76	4896.53	111.10
37.	SDN	2987.06	4689.95	4689.95	4689.95	4628.45	6370.32	3525.43	1468.31	6414.59
38.	SHA	3224.30	4316.37	4316.37	4316.37	4213.34	5592.43	2273.73	2171.57	5566.88
39.	SUK	942.69	2643.09	2643.09	2643.09	2585.61	4339.12	1992.60	647.11	4393.02
40.	TAN	3526.68	5135.54	5135.54	5135.54	5058.70	6736.08	3609.33	1950.76	6757.63
41.	TSW	3224.30	4316.37	4316.37	4316.37	4213.34	5592.43	2273.73	2171.57	5566.88
42.	VEN	3224.30	4316.37	4316.37	4316.37	4213.34	5592.43	2273.73	2171.57	5566.88
43.	YOR	2583.91	1043.64	1043.64	1043.64	1014.91	1103.56	2219.69	3917.75	1090.50

C-13. Continued.

	TRIBE	28.	29.	30.	31.	32.	33.	34.	35.	36.
1.	AKA	3322.88	111.05	1888.17	2311.10	1115.69	3122.88	3111.38	3111.38	3621.50
2.	AOY	6404.33	3515.03	3425.13	5509.13	4335.11	674.64	1807.33	1807.33	6782.17
3.	ASY	6490.54	3572.32	3518.97	5590.24	4410.78	666.75	1907.20	1907.20	6867.15
4.	BAG	1422.54	4829.21	4144.50	2424.27	3614.78	7416.22	6048.54	6048.54	1243.10
5.	BAK	2132.83	1336.80	1555.70	1139.75	110.92	4089.76	3432.84	3432.84	2462.57
6.	BAN	1332.78	2133.29	1939.20	399.86	914.19	4847.59	3953.23	3953.23	1679.95
7.	BAO	625.49	3793.97	3080.45	1450.81	2569.22	6331.89	5029.77	5029.77	808.11
8.	BAS	3322.88	111.05	1888.17	2311.10	1115.69	3122.88	3111.38	3111.38	3621.50
9.	BEO	6270.44	3219.61	3384.16	5338.40	4132.39	222.25	2012.04	2012.04	6637.05
10.	BIE	3150.62	2043.46	111.10	2434.73	1670.48	3300.19	1935.58	1935.58	3546.46
11.	BOZ	621.70	3963.94	3687.02	1566.20	2803.65	6769.20	5699.61	5699.61	242.99
12.	BUS	3959.48	2532.19	945.39	3275.61	2454.42	2833.97	1130.56	1130.56	4357.28
13.	BWA	2235.91	1226.20	1559.62	1237.47	0.00	4002.73	3397.27	3397.27	2561.08
14.	CHO	3138.86	1577.16	396.43	2309.42	1351.73	3110.38	2068.91	2068.91	3524.12
15.	CUA	3534.09	2547.32	675.39	2913.77	2233.23	3279.55	1591.87	1591.87	3932.22
16.	DOG1	566.09	3692.42	3566.81	1337.53	2564.40	6557.01	5592.43	5592.43	247.00
17.	DOG3	596.45	3793.47	3632.46	1427.44	2658.54	6646.66	5655.78	5655.78	222.24
18.	DYO	1666.64	5095.98	4511.81	2678.92	3896.95	7758.10	6434.20	6434.20	1407.40
19.	EFE2	3185.40	248.29	1908.60	2173.03	998.72	3279.55	3224.30	3224.30	3478.24
20.	FAL1	1531.95	1977.71	2375.03	592.04	953.63	4925.06	4316.37	4316.37	1773.41
21.	FAL2	1531.95	1977.71	2375.03	592.04	953.63	4925.06	4316.37	4316.37	1773.41
22.	FAL3	1531.95	1977.71	2375.03	592.04	953.63	4925.06	4316.37	4316.37	1773.41
23.	FOU	1538.26	1932.07	2265.97	560.62	865.78	4853.00	4213.34	4213.34	1800.40
24.	FUL	566.09	3692.42	3566.81	1337.53	2564.40	6557.01	5592.43	5592.43	247.00
25.	GIN	2827.19	1888.55	247.70	2086.37	1351.73	3515.15	2273.73	2273.73	3220.76
26.	HEH	4556.22	1355.23	2108.35	3574.70	2339.82	1703.36	2171.57	2171.57	4896.53
27.	KUR	494.78	3758.00	3546.01	1372.08	2608.01	6586.41	5566.88	5566.88	111.10
28.	KUS	0.00	3429.36	3066.08	1012.40	2235.91	6166.23	5081.56	5081.56	398.18
29.	LES	3429.36	0.00	1961.17	2417.24	1226.20	3051.40	3113.24	3113.24	3725.15
30.	LUI	3066.08	1961.17	0.00	2334.07	1559.62	3334.97	2027.62	2027.62	3460.83
31.	MAN	1012.40	2417.24	2334.07	0.00	1237.47	5219.65	4351.73	4351.73	1323.64
32.	MAN	2235.91	1226.20	1559.62	1237.47	0.00	4002.73	3397.27	3397.27	2561.08
33.	MER	6166.23	3051.40	3334.97	5219.65	4002.73	0.00	2097.02	2097.02	6526.98
34.	NOB	5081.56	3113.24	2027.62	4351.73	3397.27	2097.02	0.00	0.00	5478.57
35.	PEO	5081.56	3113.24	2027.62	4351.73	3397.27	2097.02	0.00	0.00	5478.57
36.	SAS	398.18	3725.15	3460.83	1323.64	2561.08	6526.98	5478.57	5478.57	0.00
37.	SON	6023.25	2745.87	3377.16	5042.78	3807.04	565.73	2472.22	2472.22	6364.81
38.	SHA	5081.56	3113.24	2027.62	4351.73	3397.27	2097.02	0.00	0.00	5478.57
39.	SUK	4030.37	711.43	1974.54	3028.64	1794.51	2340.04	2610.87	2610.87	4351.05
40.	TAN	6324.05	3305.91	3413.43	5399.63	4199.72	333.38	1977.28	1977.28	6693.37
41.	TSW	5081.56	3113.24	2027.62	4351.73	3397.27	2097.02	0.00	0.00	5478.57
42.	VEN	5081.56	3113.24	2027.62	4351.73	3397.27	2097.02	0.00	0.00	5478.57
43.	YOR	642.66	2823.63	2463.27	454.47	1611.92	5523.63	4489.21	4489.21	1015.25

C-13. Continued.

	TRIBE	37.	38.	39.	40.	41.	42.	43.
1.	AKA	2830.68	3111.38	785.62	3371.17	3111.38	3111.38	2715.15
2.	AOY	1240.09	1807.33	2812.78	348.60	1807.33	1807.33	5767.50
3.	ASY	1226.80	1907.20	2867.20	333.38	1907.20	1907.20	5852.86
4.	BAG	7334.92	6048.54	5397.77	7535.42	6048.54	6048.54	2005.69
5.	BAK	3903.05	3432.84	1898.08	4281.71	3432.84	3432.84	1505.85
6.	BAM	4691.14	3953.23	2703.63	5019.23	3953.23	3953.23	699.31
7.	BAO	6251.43	5029.77	4333.67	6455.28	5029.77	5029.77	999.83
8.	BAS	2830.68	3111.38	785.62	3371.17	3111.38	3111.38	2715.15
9.	BEO	785.03	2012.04	2508.80	111.12	2012.04	2012.04	5628.60
10.	BIE	3361.48	1935.58	2024.92	3368.13	1935.58	1935.58	2553.65
11.	BOZ	6607.76	5699.61	4592.85	6934.25	5699.61	5699.61	1253.25
12.	BUS	3030.97	1130.56	2270.90	2826.28	1130.56	1130.56	3379.01
13.	BWA	3807.04	3397.27	1794.51	4199.72	3397.27	3397.27	1611.92
14.	CHO	3096.84	2068.91	1583.18	3223.32	2068.91	2068.91	2510.09
15.	CUA	3438.98	1591.87	2421.05	3288.48	1591.87	1591.87	2974.96
16.	DOG1	6370.32	5592.43	4339.12	6736.08	5592.43	5592.43	1103.56
17.	DOG3	6465.33	5655.78	4437.00	6822.59	5655.78	5655.78	1171.42
18.	DYO	7655.99	6434.20	5689.44	7087.47	6434.20	6434.20	2286.58
19.	EFE2	2987.06	3224.30	942.69	3526.68	3224.30	3224.30	2583.91
20.	FAL1	4689.95	4316.37	2643.09	5135.54	4316.37	4316.37	1043.64
21.	FAL2	4689.95	4316.37	2643.09	5135.54	4316.37	4316.37	1043.64
22.	FAL3	4689.95	4316.37	2643.09	5135.54	4316.37	4316.37	1043.64
23.	FOU	4628.45	4213.34	2585.61	5058.70	4213.34	4213.34	1014.91
24.	FUL	6370.32	5592.43	4339.12	6736.08	5592.43	5592.43	1103.56
25.	GIN	3525.43	2273.73	1992.60	3609.33	2273.73	2273.73	2219.69
26.	HEH	1468.31	2171.57	647.11	1950.76	2171.57	2171.57	3917.75
27.	KUR	6414.59	5566.88	4393.02	6757.63	5566.88	5566.88	1090.50
28.	KUS	6023.25	5081.56	4030.37	6324.05	5081.56	5081.56	642.66
29.	LES	2745.87	3113.24	711.43	3305.91	3113.24	3113.24	2823.63
30.	LUI	3377.16	2027.62	1974.54	3413.43	2027.62	2027.62	2463.27
31.	MAM	5042.78	4351.73	3028.64	5399.63	4351.73	4351.73	454.47
32.	MAN	3807.04	3397.27	1794.51	4199.72	3397.27	3397.27	1611.92
33.	MER	565.73	2097.02	2340.04	333.38	2097.02	2097.02	5523.63
34.	NOB	2472.22	0.00	2610.87	1977.28	0.00	0.00	4489.21
35.	PEO	2472.22	0.00	2610.87	1977.28	0.00	0.00	4489.21
36.	SAS	6364.81	5478.57	4351.05	6693.37	5478.57	5478.57	1015.25
37.	SON	0.00	2472.22	2049.98	895.23	2472.22	2472.22	5383.67
38.	SHA	2472.22	0.00	2610.87	1977.28	0.00	0.00	4489.21
39.	SUK	2049.98	2610.87	0.00	2596.05	2610.87	2610.87	3402.91
40.	TAN	895.23	1977.28	2596.05	0.00	1977.28	1977.28	5682.93
41.	TSW	2472.22	0.00	2610.87	1977.28	0.00	0.00	4489.21
42.	VEN	2472.22	0.00	2610.87	1977.28	0.00	0.00	4489.21
43.	YOR	5383.67	4489.21	3402.91	5682.93	4489.21	4489.21	0.00

C-14. Female palmar Sample Set Geographic Distance Matrix.

	TRIBE	1.	2.	3.	4.	5.	6.	7.	8.	9.
1.	AKA	0.00	4720.82	1226.20	2023.83	3683.95	0.00	1973.67	2491.81	1115.69
2.	BAG	4720.82	0.00	3507.17	2700.63	1085.32	4720.82	4206.17	4925.06	3614.78
3.	BAK	1226.20	3507.17	0.00	807.12	2459.45	1226.20	1666.82	2466.56	110.92
4.	BAM	2023.83	2700.63	807.12	0.00	1662.80	2023.83	2041.29	2882.72	914.19
5.	BAO	3683.95	1085.32	2459.45	1662.80	0.00	3683.95	3148.15	3899.72	2569.22
6.	BAS	0.00	4720.82	1226.20	2023.83	3683.95	0.00	1973.67	2491.81	1115.69
7.	BIE	1973.67	4206.17	1666.82	2041.29	3148.15	1973.67	0.00	841.49	1670.48
8.	BUS	2491.81	4925.06	2466.56	2882.72	3899.72	2491.81	841.49	0.00	2454.42
9.	BWA	1115.69	3614.78	110.92	914.19	2569.22	1115.69	1670.48	2454.42	0.00
10.	CHO	1509.63	4312.61	1374.24	1909.79	3232.02	1509.63	467.48	1111.22	1351.73
11.	CUA	2487.64	4456.82	2225.13	2531.89	3442.67	2487.64	565.93	477.56	2233.23
12.	DOG3	3692.42	1315.89	2564.40	1803.55	1023.64	3692.42	3720.91	4539.18	2658.54
13.	DYO	4989.43	398.18	3791.85	2985.86	1434.01	4989.43	4576.88	5308.31	3896.95
14.	FAL1	1879.74	2953.84	894.34	646.43	2029.40	1879.74	2484.24	3312.51	953.63
15.	FAL2	1879.74	2953.84	894.34	646.43	2029.40	1879.74	2484.24	3312.51	953.63
16.	FOU	1831.43	2960.40	799.84	554.08	2010.52	1831.43	2375.00	3204.51	865.78
17.	GIN	1805.56	3932.84	1338.05	1691.73	2861.58	1805.56	350.80	1191.74	1351.73
18.	HEH	1421.58	5882.37	2435.02	3223.68	4802.69	1421.58	2125.47	2114.48	2339.82
19.	KUR	3655.61	1275.24	2511.65	1739.36	915.48	3655.61	3633.11	4447.85	2608.01
20.	LES	111.05	4829.21	1336.80	2133.29	3793.97	111.05	2043.46	2532.19	1226.20
21.	LUI	1888.17	4144.50	1555.70	1939.20	3080.45	1888.17	111.10	945.39	1559.62
22.	MAL	2246.46	6161.89	2972.87	3675.67	5081.92	2246.46	2013.40	1600.21	2901.18
23.	MAM	2311.10	2424.27	1139.75	399.86	1450.81	2311.10	2434.73	3275.61	1237.47
24.	MER	3122.88	7416.22	4089.76	4847.59	6331.89	3122.88	3300.19	2833.97	4002.73
25.	NDB	3111.38	6048.54	3432.84	3953.23	5029.77	3111.38	1935.58	1130.56	3397.27
26.	PED	3111.38	6048.54	3432.84	3953.23	5029.77	3111.38	1935.58	1130.56	3397.27
27.	SAS	3621.50	1243.10	2462.57	1679.95	808.11	3621.50	3546.46	4357.28	2561.08
28.	SDN	2830.68	7334.92	3903.05	4691.14	6251.43	2830.68	3361.48	3030.97	3807.04
29.	SHA	3111.38	6048.54	3432.84	3953.23	5029.77	3111.38	1935.58	1130.56	3397.27
30.	TSW	3111.38	6048.54	3432.84	3953.23	5029.77	3111.38	1935.58	1130.56	3397.27
31.	VEN	3111.38	6048.54	3432.84	3953.23	5029.77	3111.38	1935.58	1130.56	3397.27
32.	YOR	2715.15	2005.69	1505.85	699.31	999.83	2715.15	2553.65	3379.01	1611.92

C-14. Continued.

	TRIBE	10.	11.	12.	13.	14.	15.	16.	17.	18.
1.	AKA	1509.63	2487.64	3692.42	4989.43	1879.74	1879.74	1831.43	1805.56	1421.58
2.	BAG	4312.61	4456.82	1315.89	398.18	2953.84	2953.84	2960.40	3932.84	5882.37
3.	BAK	1374.24	2225.13	2564.40	3791.85	894.34	894.34	799.84	1338.05	2435.02
4.	BAM	1909.79	2531.89	1803.55	2985.86	646.43	646.43	554.08	1691.73	3223.68
5.	BAO	3232.02	3442.67	1023.64	1434.01	2029.40	2029.40	2010.52	2861.58	4802.69
6.	BAS	1509.63	2487.64	3692.42	4989.43	1879.74	1879.74	1831.43	1805.56	1421.58
7.	BIE	467.48	565.93	3720.91	4576.88	2484.24	2484.24	2375.00	350.80	2125.47
8.	BUS	1111.22	477.56	4539.18	5308.31	3312.51	3312.51	3204.51	1191.74	2114.48
9.	BWA	1351.73	2233.23	2658.54	3896.95	953.63	953.63	865.78	1351.73	2339.82
10.	CHO	0.00	988.68	3678.26	4664.76	2248.78	2248.78	2144.94	438.99	1761.77
11.	CUA	988.68	0.00	4121.11	4842.40	3018.31	3018.31	2907.89	888.98	2386.33
12.	DOG3	3678.26	4121.11	0.00	1418.92	1821.69	1821.69	1861.44	3389.94	4998.33
13.	DYO	4664.76	4842.40	1418.92	0.00	3173.59	3173.59	3192.41	4295.08	6195.49
14.	FAL1	2248.78	3018.31	1821.69	3173.59	0.00	0.00	111.08	2137.21	3236.77
15.	FAL2	2248.78	3018.31	1821.69	3173.59	0.00	0.00	111.08	2137.21	3236.77
16.	FOU	2144.94	2907.89	1861.44	3192.41	111.08	111.08	0.00	2027.54	3170.47
17.	GIN	438.99	888.98	3389.94	4295.08	2137.21	2137.21	2027.54	0.00	2200.54
18.	HEH	1761.77	2386.33	4998.33	6195.49	3236.77	3236.77	3170.47	2200.54	0.00
19.	KUR	3600.40	4026.30	111.12	1408.87	1794.36	1794.36	1827.88	3304.64	4946.65
20.	LES	1577.16	2547.32	3793.47	5095.98	1977.71	1977.71	1932.07	1888.55	1355.23
21.	LUI	396.43	675.39	3632.46	4511.81	2375.03	2375.03	2265.97	247.70	2108.35
22.	MAL	1849.92	2018.25	5477.14	6514.50	3852.69	3852.69	3766.94	2238.82	1005.95
23.	MAM	2309.42	2913.77	1427.44	2678.92	592.04	592.04	560.62	2086.37	3574.70
24.	MER	3110.38	3279.55	6646.66	7758.10	4925.06	4925.06	4853.00	3515.15	1703.36
25.	NDB	2068.91	1591.87	5655.78	6434.20	4316.37	4316.37	4213.34	2273.73	2171.57
26.	PED	2068.91	1591.87	5655.78	6434.20	4316.37	4316.37	4213.34	2273.73	2171.57
27.	SAS	3524.12	3932.22	222.24	1407.40	1773.41	1773.41	1800.40	3220.76	4896.53
28.	SDN	3096.84	3438.98	6465.33	7655.99	4689.95	4689.95	4628.45	3525.43	1468.31
29.	SHA	2068.91	1591.87	5655.78	6434.20	4316.37	4316.37	4213.34	2273.73	2171.57
30.	TSW	2068.91	1591.87	5655.78	6434.20	4316.37	4316.37	4213.34	2273.73	2171.57
31.	VEN	2068.91	1591.87	5655.78	6434.20	4316.37	4316.37	4213.34	2273.73	2171.57
32.	YOR	2510.09	2974.96	1171.42	2286.58	1043.64	1043.64	1014.91	2219.69	3917.75

C-14. Continued.

	TRIBE	19.	20.	21.	22.	23.	24.	25.	26.	27.
1.	AKA	3655.61	111.05	1888.17	2246.46	2311.10	3122.88	3111.38	3111.38	3621.50
2.	BAG	1275.24	4829.21	4144.50	6161.89	2424.27	7416.22	6048.54	6048.54	1243.10
3.	BAK	2511.65	1336.80	1555.70	2972.87	1139.75	4089.76	3432.84	3432.84	2462.57
4.	BAM	1739.36	2133.29	1939.20	3675.67	399.86	4847.59	3953.23	3953.23	1679.95
5.	BAO	915.48	3793.97	3080.45	5081.92	1450.81	6331.89	5029.77	5029.77	808.11
6.	BAS	3655.61	111.05	1888.17	2246.46	2311.10	3122.88	3111.38	3111.38	3621.50
7.	BIE	3633.11	2043.46	111.10	2013.40	2434.73	3300.19	1935.58	1935.58	3546.46
8.	BUS	4447.85	2532.19	945.39	1600.21	3275.61	2833.97	1130.56	1130.56	4357.28
9.	BWA	2608.01	1226.20	1559.62	2901.18	1237.47	4002.73	3397.27	3397.27	2561.08
10.	CHO	3600.40	1577.16	396.43	1849.92	2309.42	3110.38	2068.91	2068.91	3524.12
11.	CUA	4026.30	2547.32	675.39	2018.25	2913.77	3279.55	1591.87	1591.87	3932.22
12.	DOG3	111.12	3793.47	3632.46	5477.14	1427.44	6646.66	5655.78	5655.78	222.24
13.	DYO	1408.87	5095.98	4511.81	6514.50	2678.92	7758.10	6434.20	6434.20	1407.40
14.	FAL1	1794.36	1977.71	2375.03	3852.69	592.04	4925.06	4316.37	4316.37	1773.41
15.	FAL2	1794.36	1977.71	2375.03	3852.69	592.04	4925.06	4316.37	4316.37	1773.41
16.	FOU	1827.88	1932.07	2265.97	3766.94	560.62	4853.00	4213.34	4213.34	1800.40
17.	GIN	3304.64	1888.55	247.70	2238.82	2006.37	3515.15	2273.73	2273.73	3220.76
18.	HEH	4946.65	1355.23	2108.35	1005.95	3574.70	1703.36	2171.57	2171.57	4896.53
19.	KUR	0.00	3758.00	3546.01	5407.66	1372.08	6586.41	5566.88	5566.88	111.10
20.	LES	3758.00	0.00	1961.17	2211.41	2417.24	3051.40	3113.24	3113.24	3725.15
21.	LUI	3546.01	1961.17	0.00	2050.65	2334.07	3334.97	2027.62	2027.62	3460.83
22.	MAL	5407.66	2211.41	2050.65	0.00	4064.09	1287.22	1233.82	1233.82	5339.23
23.	MAN	1372.08	2417.24	2334.07	4064.09	0.00	5219.65	4351.73	4351.73	1323.64
24.	MER	6586.41	3051.40	3334.97	1287.22	5219.65	0.00	2097.02	2097.02	6526.98
25.	NDB	5566.88	3113.24	2027.62	1233.82	4351.73	2097.02	0.00	0.00	5478.57
26.	PED	5566.88	3113.24	2027.62	1233.82	4351.73	2097.02	0.00	0.00	5478.57
27.	SAS	111.10	3725.15	3460.83	5339.23	1323.64	6526.98	5478.57	5478.57	0.00
28.	SON	6414.59	2745.87	3377.16	1431.00	5042.78	565.73	2472.22	2472.22	6364.81
29.	SHA	5566.88	3113.24	2027.62	1233.82	4351.73	2097.02	0.00	0.00	5478.57
30.	TSW	5566.88	3113.24	2027.62	1233.82	4351.73	2097.02	0.00	0.00	5478.57
31.	VEN	5566.88	3113.24	2027.62	1233.82	4351.73	2097.02	0.00	0.00	5478.57
32.	YOR	1090.50	2823.63	2463.27	4325.34	454.47	5523.63	4489.21	4489.21	1015.25

C-14. Continued.

	TRIBE	28.	29.	30.	31.	32.
1.	AKA	2830.68	3111.38	3111.38	3111.38	2715.15
2.	BAG	7334.92	6048.54	6048.54	6048.54	2005.69
3.	BAK	3903.05	3432.84	3432.84	3432.84	1505.85
4.	BAM	4691.14	3953.23	3953.23	3953.23	699.31
5.	BAO	6251.43	5029.77	5029.77	5029.77	999.83
6.	BAS	2830.68	3111.38	3111.38	3111.38	2715.15
7.	BIE	3361.48	1935.58	1935.50	1935.58	2553.65
8.	BUS	3030.97	1130.56	1130.56	1130.56	3379.01
9.	BWA	3807.04	3397.27	3397.27	3397.27	1611.92
10.	CHO	3096.84	2068.91	2068.91	2068.91	2510.09
11.	CUA	3438.98	1591.87	1591.87	1591.87	2974.96
12.	DOG3	6465.33	5655.78	5655.78	5655.78	1171.42
13.	DYO	7655.99	6434.20	6434.20	6434.20	2286.58
14.	FAL1	4689.95	4316.37	4316.37	4316.37	1043.64
15.	FAL2	4689.95	4316.37	4316.37	4316.37	1043.64
16.	FOU	4628.45	4213.34	4213.34	4213.34	1014.91
17.	GIN	3525.43	2273.73	2273.73	2273.73	2219.69
18.	HEH	1468.31	2171.57	2171.57	2171.57	3917.75
19.	KUR	6414.59	5566.88	5566.88	5566.88	1090.50
20.	LES	2745.87	3113.24	3113.24	3113.24	2823.63
21.	LUI	3377.16	2027.62	2027.62	2027.62	2463.27
22.	MAL	1431.00	1233.82	1233.82	1233.82	4325.34
23.	MAM	5042.78	4351.73	4351.73	4351.73	454.47
24.	MER	565.73	2097.02	2097.02	2097.02	5523.63
25.	NOB	2472.22	0.00	0.00	0.00	4489.21
26.	PED	2472.22	0.00	0.00	0.00	4489.21
27.	SAS	6364.81	5478.57	5478.57	5478.57	1015.25
28.	SON	0.00	2472.22	2472.22	2472.22	5383.67
29.	SHA	2472.22	0.00	0.00	0.00	4489.21
30.	TSW	2472.22	0.00	0.00	0.00	4489.21
31.	VEN	2472.22	0.00	0.00	0.00	4489.21
32.	YOR	5383.67	4489.21	4489.21	4489.21	0.00

VITA

David Roehm Hunt was born on May 15, 1958, in Rochester, Minnesota. After graduating in the top 10% from Washington Community High School in 1976, he continued his education at the University of Illinois, Urbana, graduating with honors in 1980 with two Bachelors of Arts, one in Anthropology and the other in Classics. He continued his post-graduate studies at the University of Tennessee, Knoxville and received his Masters of Arts in Anthropology in 1983.

During his undergraduate career, David participated in archaeological field excavations in southern and central Illinois, Louisiana and in Sicily as well as aiding in archaeological laboratory work. He was employed as a metals conservationist from 1978-1980 with the World Heritage Museum at the University of Illinois where he was responsible for curation and research of French Bronze Age artifacts. He also assisted as osteologist for various research projects, making several trips to the Field Museum of Natural History to measure Hominoid post-cranial material.

At the University of Tennessee David has been an active participant in forensic case work, the Forensic Data Bank project and the ongoing human decay-rate study. As the dermatoglyphics research assistant from 1986-1989 he has concentrated research and publications in this area as well as in the areas of skeletal biology and human variation. He has had the opportunity to teach a class in human variation and several lectures on dermatoglyphics, skeletal biology/osteology and computer usage.

Beginning in 1986 with a grant from the Wenner-Gren Foundation, he became involved with the Boas Anthropometric Data Collection on loan from the American Museum of Natural History. He was responsible for the organization and entry of this material into a computer data base. In 1989 he became a Research Associate with the University of Tennessee through a NSF research grant, continuing his research with the Boas material.

David is a full member of the American Association of Physical Anthropologists, Society for American Archaeology, Sigma-Xi Scientific Research Society, American Dermatoglyphics Association and Human Biology Council as well as a life member of the University of Illinois Alumni Association, a sustaining member to the University of Tennessee Alumni Association, a member of the First United Methodist Church and an Eagle Scout. He is married to Cynthia Morris Hunt, a Masters of Arts graduate in Music Performance from the University of Tennessee and choral director at Webb School of Knoxville. Their first child will arrive in July of 1989.